IDENTIFICATION OF PRIMARY TIME DRIVERS IN COMPLIANCE FOR NON-MEDICAL STEM RESEARCH, AND BEST PRACTICES FOR REDUCING TIME INVESTMENT BY FACULTY

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A thesis submitted to Johns Hopkins University in conformity with the requirements for

The degree of Masters of Science

Baltimore, Maryland
August 2019

Abstract

An increase in time commitment for compliance measures in STEM research has been measured by the 2018 Federal Demonstration Partnership Survey (Schneider, 2019), despite widespread use of submission and signature technology, search engines, and regulatory streamlining. It is possible that this increase is primarily due to redundant and extraneous requirements, duplicate reports to multiple offices, insufficient or irrelevant training, lack of integration between various technological platforms, or lack of proactive communication with institutional compliance entities.

A survey has been administered to the end-user actors in this process, the faculty, post-doctoral associates, graduate students, and professional research associates/technicians that engage with compliance duties on a daily basis. This survey was designed to determine specific points of redundancy, duplication, confusion, and lack of training in various compliance areas; as well as requesting subjective information to determine communication and process lapses.

According to the survey results the primary time drivers in compliance functions are administratively oriented; centering on recording research results, the pre-award functions of proposal generation/proposal submission/budget creation and forecasting, the post-award functions including financial management, technical/financial interim and final reporting of various types, and publication and presentation creation. The primary requests rising from subjective comments was to obtain more quality assistance trained in compliance to assist researchers, to reduce redundancy, duplication and conflict between requirements at department, industry, and agency level, and to streamline technological amenities to avoid duplication/redundancy and increase ease of use for the end-users.

Based on these data a set of best practices has been constructed that can provide direction and possible solutions for these problems; increasing the efficacy of communication lines at all

levels of the scientific research enterprise. As a result, these best practices can improve administrative processes and reduce time commitment for compliance that can be re-invested in research activity.

Primary Reader and Advisor: Jeffrey E. Kantor, Ph.D.

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1. Introduction: The goal of this study was to reduce administrative burden, by identifying primary time drivers in compliance functions. These time drivers are experienced by those in need of the maximum amount of time devoted to research activity—the actors in the research groups whose time is diverted from a research focus to activities centering on administration and compliance. This has been a point of contention for researchers, and the process to improve this situation requires change and reorganization at every level of the research enterprise.

Why is understanding administrative burden important? The short answer is that a lack of understanding leads to communication and implementation gaps that will increase time investment at all levels of the research enterprise. Faculty have to maintain an almost impossible balance between teaching, research, service activity, publication, and compliance. There is a lack of training, communication and knowledge regarding compliance functions from federal funding agencies and their institutions frequently operate on a reactive rather than proactive mode. Federal compliance requirements have expanded and the time/resources researchers have is shifting increasingly from research activity and into administration and compliance (Optimizing the Nation's Investment, 2016). Implementation activities at the institutional level take time to be integrated, leading to repetitive documentation and delays in processing (Worzala, 2019). There is simply not enough time, resources, and training to accomplish all of these tasks and this leads to frustration and less proactivity/participation in compliance measures. Adding to the frustration is the high level of document production and preparation required to apply for federal funding and the resultant very low acceptance rates between eighteen and twenty-four percent (GAO Report, 2016).

Federal funding agencies are attempting to keep up with technological innovation and scientific discovery; with the goal of attaining the highest level of transparency and accountability possible within the research projects they sponsor. Often the communication of new requirements is murky, and the requirements do not often include best practices for implementation, as policymakers are not always aware of the operational resource and time requirements institutions experience (Nichols and Wynes, 2018). Additionally there is a lack of consistency in regulation, reporting, forms and formats, and electronic systems between agencies; which increases administrative time commitment particularly in the area of development of materials for grant proposals that have a low rate of acceptance (GAO Report, 2016).

Institutions are caught in between these two factors. In order to support the research programs taking place they try to facilitate compliance functions for faculty so that their overall time investment is reduced and eventually reinvested into research time. In order to remain accountable to the federal funding agencies, they provide due diligence by enacting policy, training, and documentation standards that the faculty, students, and professional researchers must follow. Due to the decreased federal funding for public universities, institutions are forced to accomplish more with fewer resources and their methods of communication and training are reactive in nature (Nichols and Wynes, 2018); and the responsibility for adherence to compliance standards is increasingly shuttled to faculty that are already experiencing time shortages for their research programs. Due to reduced resources at the institutional level, the lack of investment in cyberinfrastructure and rushed implementation creates further time investment (Research Universities and the Future of America, 2012). Some of the technologies are poorly understood, and a lack of integration and harmonization between compliance offices gives rise to duplicated

reporting and can actually increase administrative burden (Worzala, 2019). Additional duplications occur in the area of instruction and training on multiple platforms and programs (GAO Report, 2016). With the need to be responsive to all parties involved in the scientific research enterprise (Research Universities and the Future of America, 2012), further time investments are driven when agencies are also not integrated and institutional personnel must learn multiple forms, formats, systems, and requirements to remain within federal compliance standards (GAO Report, 2016).

In order to investigate faculty time investment, the terms administrative burden, time driver, and best practices need to be defined. Administrative burden is defined as being separate from administrative time investment as, "experience of policy implementation as being onerous", and it is often unavoidable, duplicative, and time consuming (Burden, et.al. 2012). It contains learning costs (the time taken to collect information on the tasks and understanding the requirements and process), psychological costs (stigma or frustration associated with the process), and compliance costs (the time/effort associated with completing the tasks) (Moynihan, et.al. 2014). A time driver is defined as a task that diverts attention away from primary research activities and adds additional costs to the research enterprise. Best practices are defined as the most effective operational techniques that have been identified for a particular situation or process based on values, standards, and feedback from actors at different levels of the scientific research enterprise. It is a solution-based approach to determine the most effective balance between accountability, transparency, innovation, and efficiency (Mold and Gregory, 2003).

In order to streamline administrative systems it is necessary to identify the primary time drivers that divert investigators' time and focus away from research. From this identification inconsistent, conflicting, and duplicative/redundant tasks can be eradicated; communication lines

can be improved, risk can be reduced, and more time at all levels of the scientific research enterprise(Optimizing the Nation's Investment, 2016) can be re-invested into research activity.

2. Narrative:

2.1 Literature Discussion: Faculty experience incredible pressure to produce research results, gain recognition through attaining and maintaining an extramural research portfolio, perform service activities, teach classes and mentor students, and publish in academic or scientific journals. The competing demands in an academic researcher's daily functions often conflict with the ability to do pure research; and the myriad tasks involving compliance functions are relegated to a lower priority in their list of time investments (Integrity in Scientific Research, 2002). If the organizational environment has its promotional benchmarks based on extramural funding and the attainment of results, compliance and administrative functions take even lower priority (Integrity in Scientific Research, 2002). With the myriad factors for promotion and recognition existing in academic research environments, the answers to the question of how much emphasis any given institution places upon proactive adherence to compliance and administrative functions varies widely (Integrity in Scientific Research, 2002). With the pressure to obtain funding at such a high level, it is not unexpected that faculty may be putting in more time than they wish on duties other than research (Gallup and Svare, 2016); and many consider applying for grants to be unconnected with the research process and instead consider it an administrative task.

The Federal Demonstration Project (FDP) originally surveyed faculty in the early 1990's to determine if regulatory changes in both pre- and post-award administrative functions had reduced the investment of faculty principal investigators, and if the time saved was actually reinvested in research. Faculty respondents were positive about suggested changes but indicated that the time saved would be likely be utilized to fulfill other compliance requirements (Decker, et.al. 2007).

The FDP repeated its faculty workload survey in a more formalized fashion in 2005, and the respondent data showed that principal investigators allocated forty-two percent of their time spent on federal grants on administrative and compliance tasks. Ninety-five percent of the respondents felt that administrative support was worthwhile to the research process, and sixty-eight percent of that group was amenable to allocating direct costs toward this goal (Decker, et.al. 2007). The suggestions coming from the 2005 survey stated that some of the administrative tasks required for compliance with federal regulation required specialized training and knowledge, addition of skilled positions; and a suggestion to modify Circular A-21 (OMB A-21, 2004) to allow for administrative and compliance assistance to be considered a direct cost and therefore allocable to grant budgets. The study determined administrative and compliance tasks should be uniform and streamlined across institutions and federal agencies, to lower a redundant training burden and reduce completion time for submissions and forms. Additionally suggested was that the utilization of emerging technologies to develop electronic submissions of grant proposals would reduce administrative time investment significantly.

The FDP, now the Federal Demonstration Partnership, repeated the Faculty Workload Survey in 2012 and published its results in April of 2014, finding again that principal investigators spent forty-two percent of the time allocated to research grants on administrative tasks. In this iteration of the survey, the respondents estimated a rise of nearly six percent of the median time estimate over the 2005 survey, and that approximately four hours per week could be saved for research duties if administrative assistance were utilized for compliance measures. (Schneider, et.al. 2014). Additional responses requested more clarity with federal regulations, documentation and forms; reduction of redundant requirements across agencies, a need for standardized forms, adequate focused training for faculty to understand compliance requirements

and training for administrative staff to assist with compliance duties, and adequate and harmonized oversight from institutional administration (Schneider, et.al. 2014). With a stable level of time commitment and seven years elapsed time between surveys, the FDP surmised that there must be more efficient ways to implement compliance with federal regulation. They suggested an "Efficiency Checklist" as a framework for future recommendations; including simplification, coordination, unification, and reduction of inconsistencies, requirements that generate less effort and processing for minor issues, minimization of unnecessary change, reduction of delays, elimination of points of redundancy, and an increase in clarity.

Schneider and her team repeated the faculty workload survey in 2018, and presented a preliminary report as a plenary session for the FDP in January 2019 (Schneider et.al. 2019). The respondent data showed that principal investigators were now devoting 44.3 percent of their time allocated to work on federal grants to administrative and compliance tasks. While there was a slight decrease in effort for some areas of administrative and compliance tasks, the overall time investment went up by over two percent in the intervening six years, and most of this increase is centered on proposal preparation (that is frequently rejected due to increased funding competition) as well as post-award management and reporting for the award. Considering that a high number of respondents to the FDP 2018 survey strongly agreed that a large research portfolio is a primary factor in promotion and tenure policy, many researchers feel they are at the mercy of the institutions and agencies and their compliance and reporting requirements. Additionally, respondents stated a need for available and trained administrative support to assist with compliance functions, which may or may not be considered a high priority by their institutions (Schneider et.al. 2019).

There have been some measures instituted by the federal government to mitigate administrative burden, including the institution of the Uniform Guidance (2 CFR 200, 2014), the streamlining of the Federal Acquisition Regulations (48 CFR 1-2, 2019), online regulatory search engines, and the shift to online electronic submission engines for proposals, interim reporting, and final reporting to federal funding agencies.

The Uniform Guidance, or UG, was developed between the Office of Management and Budget (whitehouse.gov, 2019), the Council on Financial Assistance Reform (Sheffler, 2017), and eight federal funding agencies in 2013, and the final version took effect December 19, 2014 (2 CFR 200, 2014). It replaced eight previous OMB circulars, including A-21, A-87, A-89, A-102, A-110, A-122, A-133, and A-50; and is listed in regulation as 2 CFR 200 (2 CFR 200, 2014). Its goal was to provide stronger and clearer oversight, eliminate duplication and conflicting regulation, and provide transparent, consistent, and efficient treatment of costs on federal awards (Cornell, 2019). The US Government Publishing Office has a searchable database of the Uniform Guidance on their website (US GPO, 2019). Additionally a standard core set of administrative terms and conditions for research grants has been developed and updated to pair with the Uniform Guidance (US GAO Report, 2016). With the elimination of duplicated/conflicting regulations with the adoption the Uniform Guidance (2 CFR 200, 2014) codifying financial management of research, understanding what the financial parameters are for federal research has become a great deal more clear. Additionally the information is searchable on the U.S. Government Publishing Office website, cutting down time investment by administrators.

The Federal Acquisition Regulation (48 CFR 1, 2019) was codified in 1984, with the current document being 2016 pages in paper format in 2019. The General Services Administration did

put this document with a searchable index online for ease of use, and has pdf and html files going as far back as 1990 (Acquisition.gov, 2019).

Various improvements have been instituted since 2000 to strike a balance between ensuring accountability, transparency, credibility of research findings (Brown, et.al. 2018), and transparency; along with streamlining administrative process and allocating the maximum amount of time for researchers to expand the knowledge base in the scientific research enterprise.

Proposal and report submission engines such as FastLane and Research.gov have provided a significant reduction in administrative time investment (FastLane.gov, 2019, Research.gov, 2019). FastLane was launched in 1994 (Research.gov FAQ, 2019) and became a standard for proposal submission; in response to a greater need for functionality NSF developed Research.gov in 2008, and this system will eventually replace FastLane completely. Grants.gov was developed between 1999 and 2003 (midatl.service.com email, 2019) for not only funding opportunity search, but also as an application portal for a number of federal agencies either directly or via link to an agency's own submission portal. Agencies using Grants.gov include the National Institutes of Health, Department of Homeland Security, Department of Education, Department of Agriculture, Department of Energy, Department of State, Department of the Interior, Department of Commerce, Department of Defense, Department of the Treasury, National Aeronautics and Space Administration, and the National Endowment for the Arts (grants.gov, 2019). In 2010 the federal government instituted a uniform format for post-award reporting, and in 2014 the Digital Accountability and Transparency Act (PL 113-101, 2014) dictated that OMB should standardize financial and administrative information for reporting to federal funding agencies (GAO Report, 2016).

Electronic routing and tracking programs for pre-award and post-award grant management (eRA, 2019) have been implemented with the intent of tracking awards from inception through to closeout. Programs such as eRA and FileMaker (FileMaker, 2019) have options to pinpoint the status of a particular proposal or contract, increasing transparency and accountability for administrators, and subsequently reducing stress and time investment for faculty inquiries during various pre-award and post-award processes.

Signature authority software and acceptance of electronic signature with date/time stamp by federal agencies has cut considerable time from the routing and signature process (Docusign.com, 2019). The decrease in time investment for faculty, administrators, and agencies is significant with the advent of electronic signature acceptance, and increases veracity over a manual signature due to the date/time stamp that is built into each electronic signature.

Funding opportunity search engines have been instituted to increase visibility of agency funding opportunities in a centralized venue, as well as providing the application requirements with each opportunity (grants.gov, 2019). The first stage of electronic notification for funding opportunities was in electronic newsletter form; it then graduated to agencies listing specific solicitations on their web pages via their specific directorates (NSF IIP, 2019). Grants.gov now provides a searchable matrix for multiple federal agencies, with links to solicitations and application portals in a centralized venue.

Online search functions for the Code of Federal Regulations (govinfo.gov, 2019) and the Federal Acquisition Regulations (acquisition.gov, 2019) have made checking the specifics of various regulations and procedures for federal grants and contracting transparent, providing a clear set of expectations and delineated processes that researchers and administrators can reference in their federally-sponsored research.

Science Experts Network Curriculum Vitae, or SciENcv (ncbi.nlm.nih.gov, 2019) was developed in 2013 to facilitate construction and maintaining federal Biosketches for proposal purposes through electronic means. While SciENcv provides central and electronic system, it does not produce a standardized format and as of 2016, no other agencies outside of the National Institutes of Health or the National Science Foundation had adopted this system as being of an acceptable standard (GAO Report, 2016).

The Office of Management and Budget mandated standardization of many federal forms in December 2013 (GAO Report, 2016) with the intent of eliminating the need for faculty and administrators to learn separate forms for each agency, thereby cutting down the time investment for those that had research funding from multiple agencies.

All of these adjustments, amenities and streamlining efforts are ongoing; and with the assistance of open communication between the actors at all levels of the scientific research enterprise, implementation and time reduction can be far more effective.

2.2 Problem Statement: Despite regulatory changes and streamlining with the Uniform Guidance, the Federal Acquisition Regulations, harmonized federal agency policies, and the institution of electronic submission engines for various pre and post-award functions, the time investment required by faculty to perform administrative tasks to remain in compliance with their award conditions has risen in the last decade. The 2006 FDP faculty burden survey stated that the amount of time spent on administrative duties was at 42.3 percent (Schneider, et.al. 2014). Proposal/report submission engines were being used widely, and the government regulatory search engines were still being developed and implemented. The 2012 FDP survey showed an identical percentage of time investment, albeit broken down into various types of pre-and-post-award activities (Schneider, et.al. 2014), even with improvements in web technology,

electronic routing, and tracking being implemented in a widespread fashion. The 2018 FDP survey preliminary results showed a further increase to 44.3 percent (Schneider, 2019) despite the institution of the Uniform Guidance, the widespread use of electronic signature authority, and further improvements to websites for funding opportunity and regulatory searches. This increase in time investment has occurred, despite the ongoing efforts to streamline. So, what is going wrong?

The increased time commitment is due to more than additional regulation based on a bad-apple approach (Redman, 2013). In addition to changing the institutional culture to reflect a norm of proactive compliance and prevention (Geller, et.al. 2010), research administration needs to take a serious look at the current processes for compliance functions. What training is available, and is it intelligible and applicable? What processes are redundant, and what contains extraneous or duplicate information requirements? What technology can best assist the researcher in recording research results quickly, and with a minimum of error? How can we store data reliably and securely for subsequent review, evaluation, and replication? I believe that asking the people working directly with the compliance actions on research projects to provide input is the most effective avenue to gain the information we need.

Increase in federal regulation and compliance requirements in the last 5 years in non-medical STEM research has created a trickle-down effect in increased liability to faculty, and an increased burden on faculty time expenditure. With the rise in time commitments necessary to fulfill compliance requirements for STEM research some faculty are less likely to undertake these duties in a proactive manner and they struggle with the time investment to engage the functions of data recording, compliance training, and reporting of research results. Their research groups comprised of post-doctoral researchers and graduate students often have less

training in the daily practices of responsible conduct in research, interaction with the particular funding agencies sponsoring their research, and the reporting requirements for each type of compliance function, and thus are less effective in closing the time investment gap (Blanked, 2019).

Some functions such as laboratory safety reports, property management, and financial management are delegated to various department administrators, whose areas of expertise center on administration and finance and therefore may not fully understand the science involved in the research group's activities. Additionally, the faculty have less time to undertake research directly as the reporting requirements have increased in detail and length, and many application functions are redundant and require the same information to be repeatedly entered into systems that do not communicate with each other. Some functions are still paper-based or require group classroom training, and this avenue takes even longer to complete.

While the FDP surveys dealt with the overall administrative burden of compliance functions, my intent is to narrow this focus in order to identify the functions that are problematic, redundant, or could be streamlined by electronic means. This can be accomplished by asking the people at the basic levels of the research process—the principal and co-investigators, the post-doctoral associates, graduate researchers, and professional research technicians that often serve as laboratory supervisors or coordinators.

The goal of the study is to determine what current processes are redundant or unnecessarily time consuming; and based on this information to develop a set of best practices to reduce time investment in compliance functions. These results could be useful for streamlining the various compliance offices within institutions of higher education; as well as research integrity offices, contracts and grants offices, and sponsored programs accounting. These best practices will also

provide an avenue for opening a dialogue between research administrators and faculty in order to reduce time and frustration for the faculty when engaging in compliance functions.

The primary questions being investigated were:

- Are the prime time drivers for compliance functions are administrative in nature?
- Are the compliance activities understood by those that need to accomplish the duties?
- How duplicative and/or redundant are compliance activities at the institutional level?
- Are compliance activities relegated to junior members of the laboratory groups, who have less experience and training in these areas?

2.3 Methodology: A survey was written and administered to determine what compliance functions take the most time; and the incidence rates with which institutions offer various amenities to accomplish compliance tasks. Additionally, faculty were asked to provide their opinions on the efficacy of various compliance services/amenities, with the intent of utilization by research administrators in future resource and direction planning.

2.31. Overview: A survey has been developed via the REDCap system at Johns Hopkins University (REDCap, 2019), and sent to researchers at multiple universities across the United States. Data generated by the survey responses has been stored in the REDCap system and analyzed to determine average amounts of time spent on various compliance activities. From these averages, the primary time drivers for compliance activities can be identified. The numerical results will then be analyzed along with data on the frequency of various streamlining processes already in place; and with these results, a set of best practices was generated to reduce the time investment currently undertaken by research groups.

2.32 Research Plan: The survey was constructed within the JHU REDCap portal for respondents to access, and the URL is

https://mrprcbcw.hosts.jhmi.edu/redcap/surveys/?s=WA43MYYXCH. The survey portal was open from June 27, 2019 to July 15, 2019 for eligible responses, to allow for reasonable time for respondents to answer. With the nature of the information that was needed, eligibility requirements to narrow the range of responses were instituted, and these are discussed in the section below that specifically delineates eligibility. Once closed, the results gained in that period were analyzed, reports run based on the data, and a set of best practices for reducing time investment in compliance activities were constructed. The original text for the survey is included in the appendices submitted with this thesis.

2.33 Recruitment of Subjects: Survey respondents were recruited directly by posting on various web forums and email lists, furnishing the URL for the survey along with instructions. The responses were kept anonymous. The intended population of study was faculty and researchers at colleges, universities, and technical schools in the United States, engaged in Science, Technology, Engineering, and Mathematics (STEM) research; that does not include medical trials. The text of the recruitment email is included in the Appendices section of this thesis, as well as a list of email lists and online venues where the recruitment request was posted.

2.34 Eligibility requirements: The intended population of study was faculty and researchers at colleges, universities, and technical schools in the United States, engaged in Science, Technology, Engineering, and Mathematics (STEM) research; that does not include medical trials. This eligibility requirement was included in the text of the recruitment advertisement, which is included in the Appendices section of this thesis.

2.35 Inclusion and exclusion criteria: Respondents were intended to be faculty, post-doctoral associates, graduate student researchers, and professional technicians that are conducting research and/or compliance functions for non-medical-trial STEM research. They

should have been conducting research at a college, university, or technical school in the United States, or programs subject to US federal regulatory compliance requirements. Respondents were asked to answer questions based on their involvement in non-medical-trial STEM research, via the online form. Respondents not performing STEM research are not eligible, and respondents only performing medical trials are not eligible.

2.36 Survey Sections: The first section of the survey had two aims; first to find out which of the various compliance functions listed takes the most time, and second to gain a total of time spent on a weekly basis accomplishing compliance functions. These identified the primary time drivers for compliance functions in non-medical-trial STEM research. The second section's purpose was to determine what research administration tools the researcher has available to them and if they are usable. The third section of the survey asked for subjective information regarding redundancy and duplication, and what changes the respondent feels would reduce their time investment. The fourth section requested non-identifying demographic information from the respondents, including type of institution, research role, length of time as a researcher, and the size of their research group. The final section provided an opportunity for further comments, if the respondent desires.

Data was imported from the REDCap system directly into an MS Excel database for use with data analysis tools. The original responses have been catalogued in an MS Excel database and included in the appendices of this thesis via pdf files. Responses are numbered, and no specifically identifying data has been requested in the survey. A de-identified summary of the survey results will be available upon request after the thesis project concludes.

2.4 Discussion of statistical methods: The statistical methods used to produce results were accomplished through MS Excel, providing mean figures for the data as well as

standard deviation figures for those data sets that were score-oriented rather than binary or subjective text natured. All bar charts and pie charts were generated from MS Excel.

2.5 IRB Approval: The above methodology was submitted to Johns Hopkins Homewood Campus Institutional Review Board (IRB) on June 18, 2019, and was approved June 19, 2019 in Exempt status, requiring a progress report to be submitted prior to the end date of June 18, 2022. The approval letter from the IRB is attached in the Appendices section of this thesis, to fulfill this requirement. The final thesis and attendant progress report will be submitted to the JHU Homewood IRB as required.

3. Project Results: The original questions posed were to identify the primary time drivers in compliance areas for non-medical-trial STEM research, identify areas of redundancy and lack of training, and to hear from those directly engaging in compliance activities what needs to evolve through streamlining or technological innovation. The questions that need to be answered rose from the literature review, and the primary questions for the data to solve were the following:

- Are the prime time drivers for compliance functions are administrative in nature?
- Are the compliance activities understood by those that need to accomplish the duties?
- How duplicative and/or redundant are compliance activities at the institutional level?
- Are compliance activities relegated to junior members of the laboratory groups, who have less experience and training in these areas?

3.1 Data Analysis: The survey received 61 responses between June 27, 2019 and July 15, 2019. The results were directly reported from the REDCap system into MS Excel. After consultation with Professor Kantor and Dr. Daniel Dvorkin of the University of Colorado Health Sciences Center Altitude Research Center, the following data points were excluded from analysis:

Mean values and standard deviations for all numerical categories except the research group size were calculated based on 59 entries. Mean values and standard deviations for the research group size were calculated based on 57 entries; and the discussion of the excluded records and data points occurs after the presentation of the results. Results are shown in table form to demonstrate numerical values; as well as with visual representation via bar chart and pie charts. Following this section is a best-practices section, which is broken down into major subjects where change, elimination, and streamlining is needed.

3.2 Discussion of Results

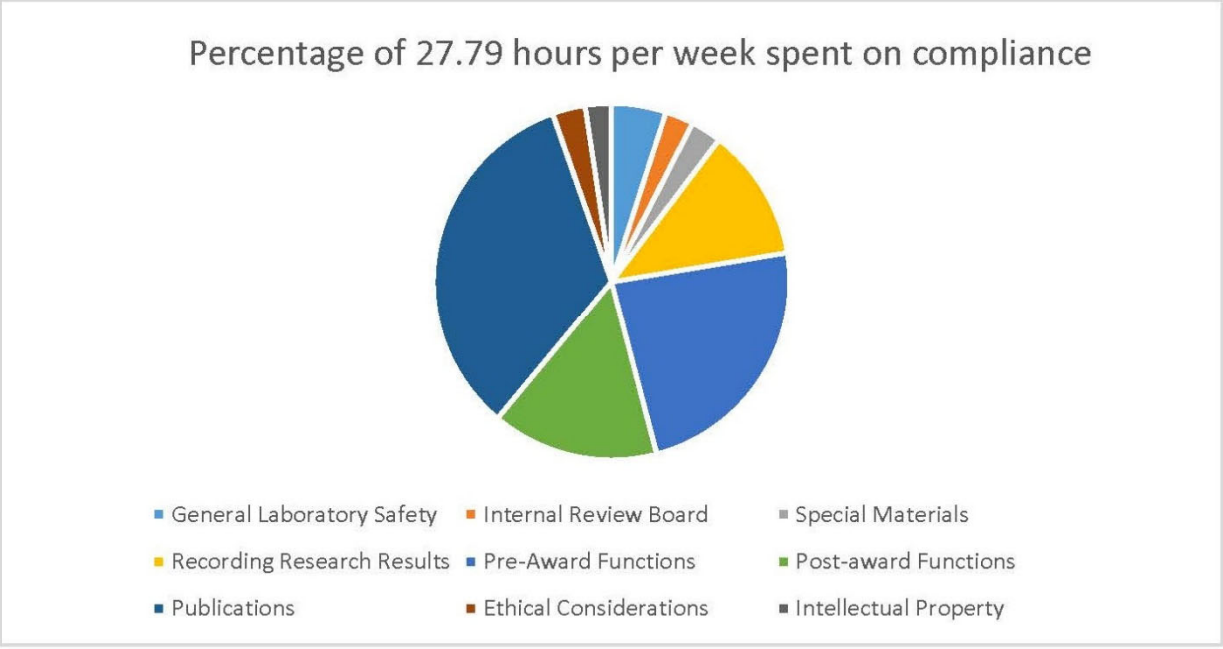
3.21 Results Presentation: The results were grouped around the questions posed by the survey.

Question 1: What is the average amount of time taken on a weekly basis to engage in compliance functions? The average time spent per week on all compliance activities was 27.79 hours. This is illustrated in numerical format in **Table 1,** and a visual representation in **Chart 1.**

Table 1. Percentage of 27.79 hours per week (average) spent on compliance tasks

Category	Percentage of 27.79 hours per week spent on compliance
General Laboratory Safety	**4.9454**
Internal Review Board	**2.5611**
Special Materials	**2.8172**
Recording Research Results	**12.0556**
Pre-Award Functions	**23.5441**
Post-Award Functions	**15.1351**
Publications	**33.5691**
Ethical Considerations	**2.988**
Intellectual Property	**2.3843**

Chart 1. Percentage of 27.79 hours per week (average) spent on compliance tasks



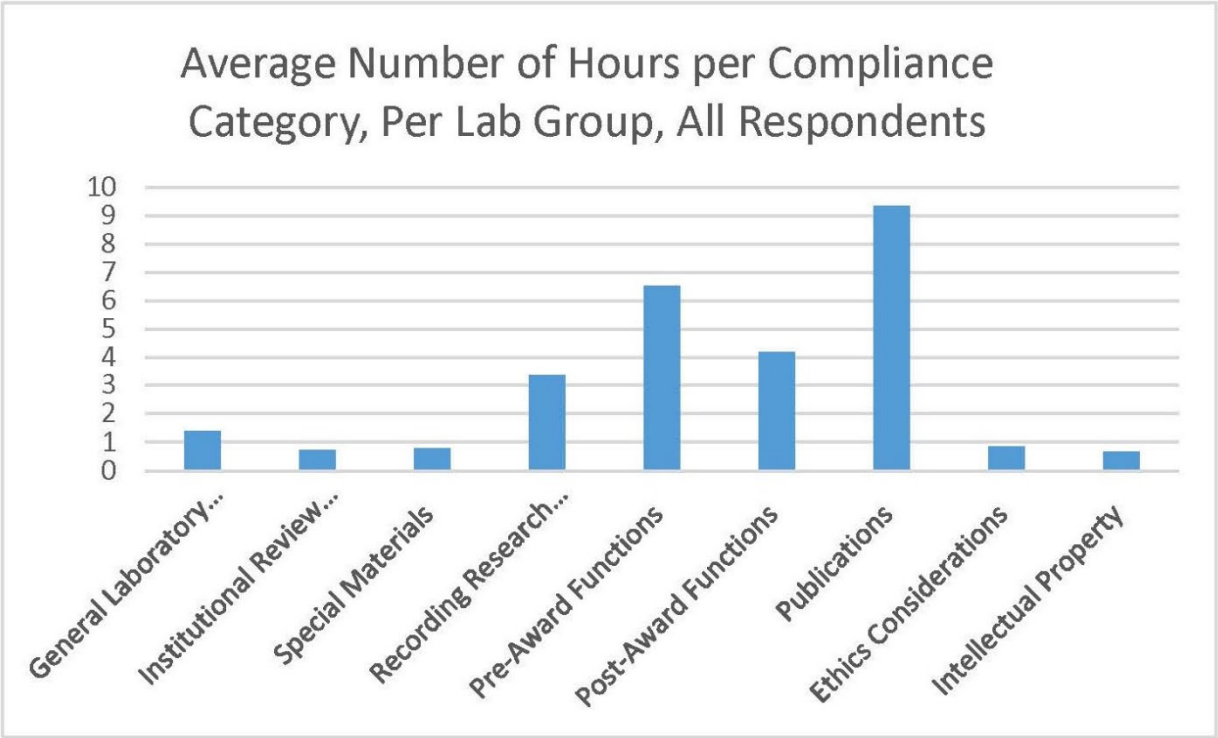
Question 2: Which compliance functions took the most time, and did it vary by the research role of the respondent? In addition to knowing which time drivers to focus on as primary time drivers, it is also important to know if the time investment varies by research role so that best practices can be developed with these end users in mind.

In the number of hours for an average lab group, the 27.7492 hours is broken down into task allocations in **Table 2** and **Chart 2,** with the same four time drivers taking the most time. Recording research results takes an average of 3.351 hours per week, pre-award functions takes 6.54 hours per week, post-award functions take 4.21 hours per week, and publications take 9.33 hours per week.

Table 2: Compliance functions taking the most time investment

Compliance Category	Average Number of Hours per Compliance Category, Per Lab Group, All Respondents
General Laboratory Safety	**1.374576**
Institutional Review Board	**0.71164**
Special Materials	**0.783051**
Recording Research Results	**3.350847**
Pre-Award Functions	**6.544068**
Post-Award Functions	**4.20678**
Publications	**9.30508**
Ethics Considerations	**0.830508**
Intellectual Property	**0.662712**

Chart 2: Compliance Functions taking the most time investment



Given that there is variability on the time spent on specific compliance tasks based on the role of the respondent, the next four tables identify the primary time drivers for each category of respondent identified in the survey (faculty, post-doctoral researcher, graduate student, and professional research assistant/technician).

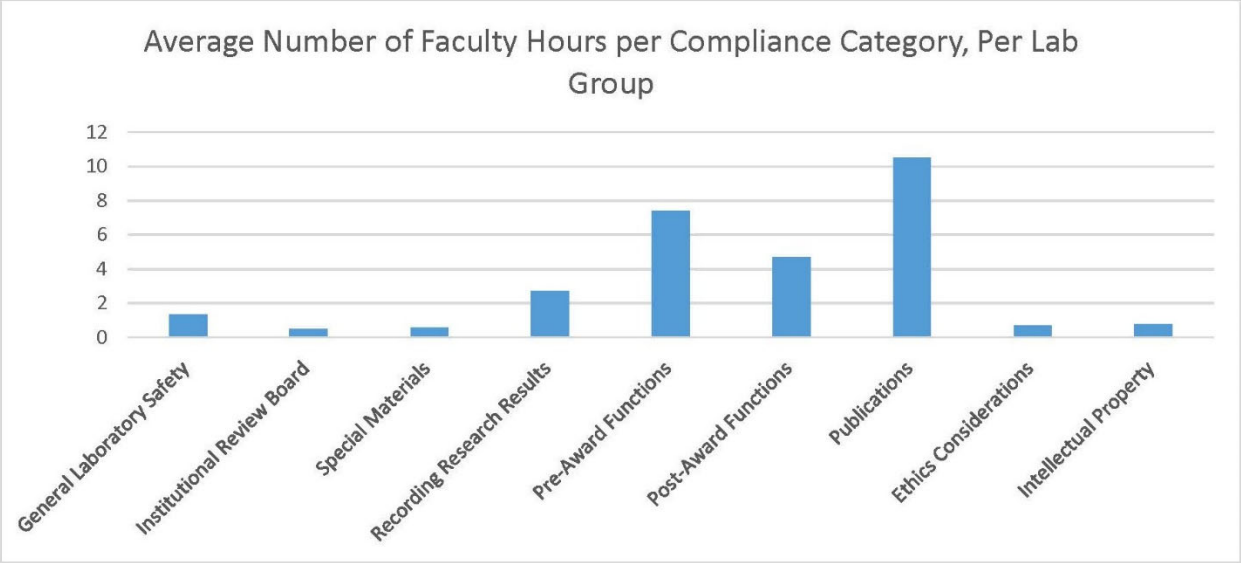
The average time spent per week on compliance was 29.13333 hours for the group of forty-four faculty respondents; their average research group size came to 9.285714, which divides out to an average of 3.780988 hours per researcher if effort were evenly distributed. This is shown in numerical format in **Table 3A**, and in a visual representation in **Chart 3A**.

Table 3A: Time investment based on the research role of the respondent – Faculty

Compliance Category	**Average number of faculty hours per compliance category, per lab group**
General Laboratory	1.328571
Institutional Review	0.471429
Special Materials	0.552381
Recording Research Results	2.72381
Pre-Award Functions	7.419048

Post-Award Functions	4.671429
Publications	10.5119
Ethics Considerations	0.671429
Intellectual Property	0.78333

Chart 3A: Time investment based on the research role of the respondent – Faculty

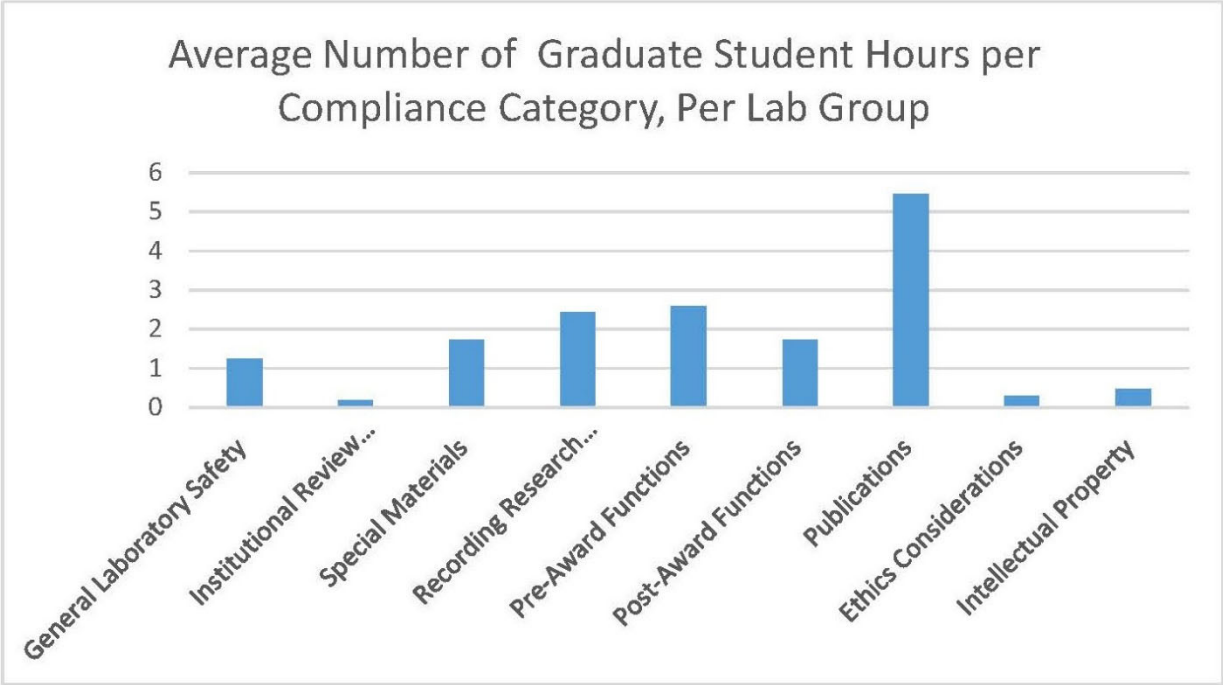


The average time spent by graduate students per week on compliance came to 16.15 hours for the group; the average research group size was 8.4545 people, which came to an average of 2.091414 hours per researcher per week if the effort is distributed evenly. This is illustrated in numerical format in **Table 3B**, and in a visual representation in **Chart 3B**.

Table 3B: Time investment based on research role of the respondent – Graduate Students

Compliance Category	Average Number of Graduate Student Hours per Compliance Category, Per Lab Group
General Laboratory	1.254545
Institutional Review	0.2
Special Materials	1.727273
Recording Research Results	2.436364
Pre-Award Functions	2.590909
Post-Award Functions	1.727273
Publications	5.454545
Ethics	0.290909
Intellectual Property	0.472727

Chart 3B: Time investment based on research role of the respondent – Graduate Students



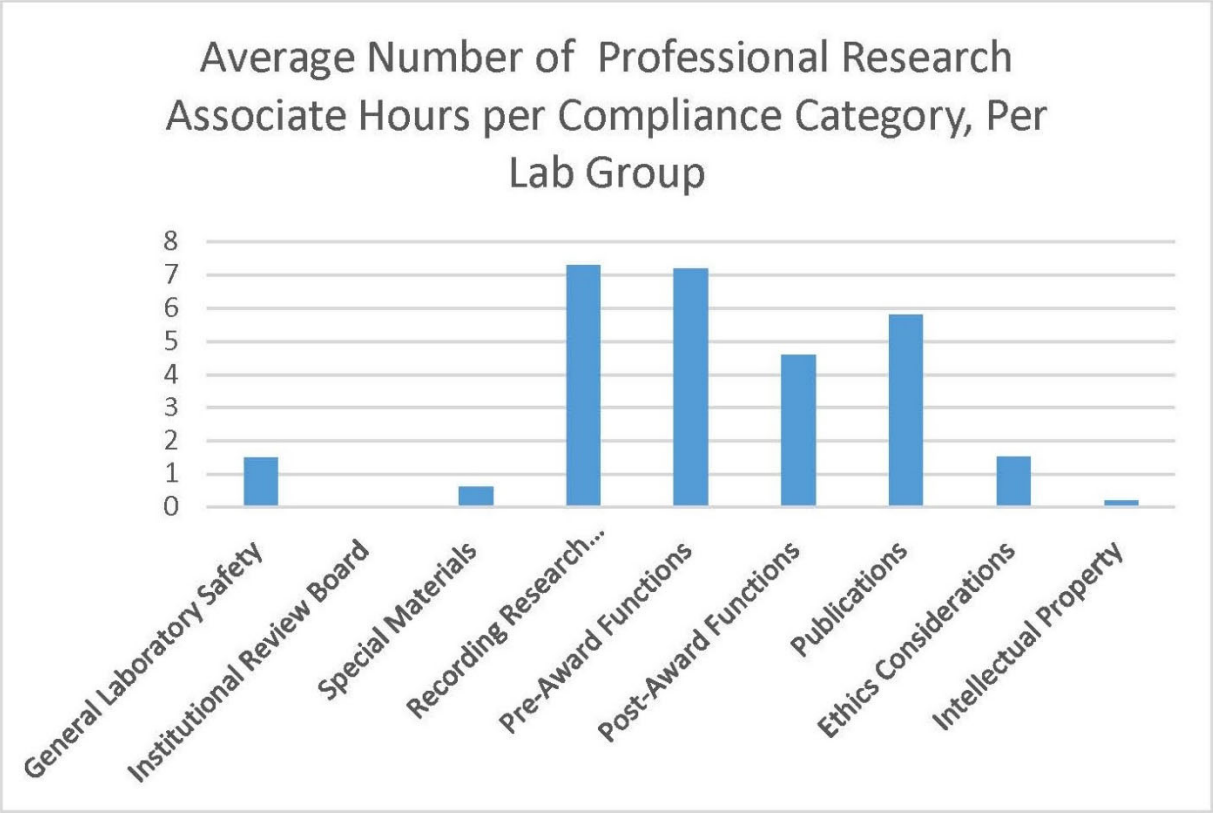
The time spent on compliance functions by professional research associates and technicians provided some interesting variants to both the overall group, as well as the other three respondent categories. The average time spent by professional research associates per week on compliance averaged to 28.72 hours with the average research group size being 18.33333 people; averaging to 4.374405 hours per researcher if effort was evenly distributed. This is illustrated in numerical format in **Table 3C**, and in a visual representation in **Chart 3C.**

Table 3C: Time investment based on research role of the respondent – Professional Research Associates/Technicians

Compliance Category	Average Number of Professional Research Associate Hours per Compliance Category, Per Lab Group
General Laboratory Safety	1.5
Institutional Review Board	0
Special Materials	0.6
Recording Research Results	7.3
Pre-Award Functions	7.2
Post-Award Functions	4.6
Publications	5.8

Ethics Considerations	1.52
Intellectual Property	0.2

Chart 3C: Time investment based on research role of the respondent – Professional Research Associates/Technicians



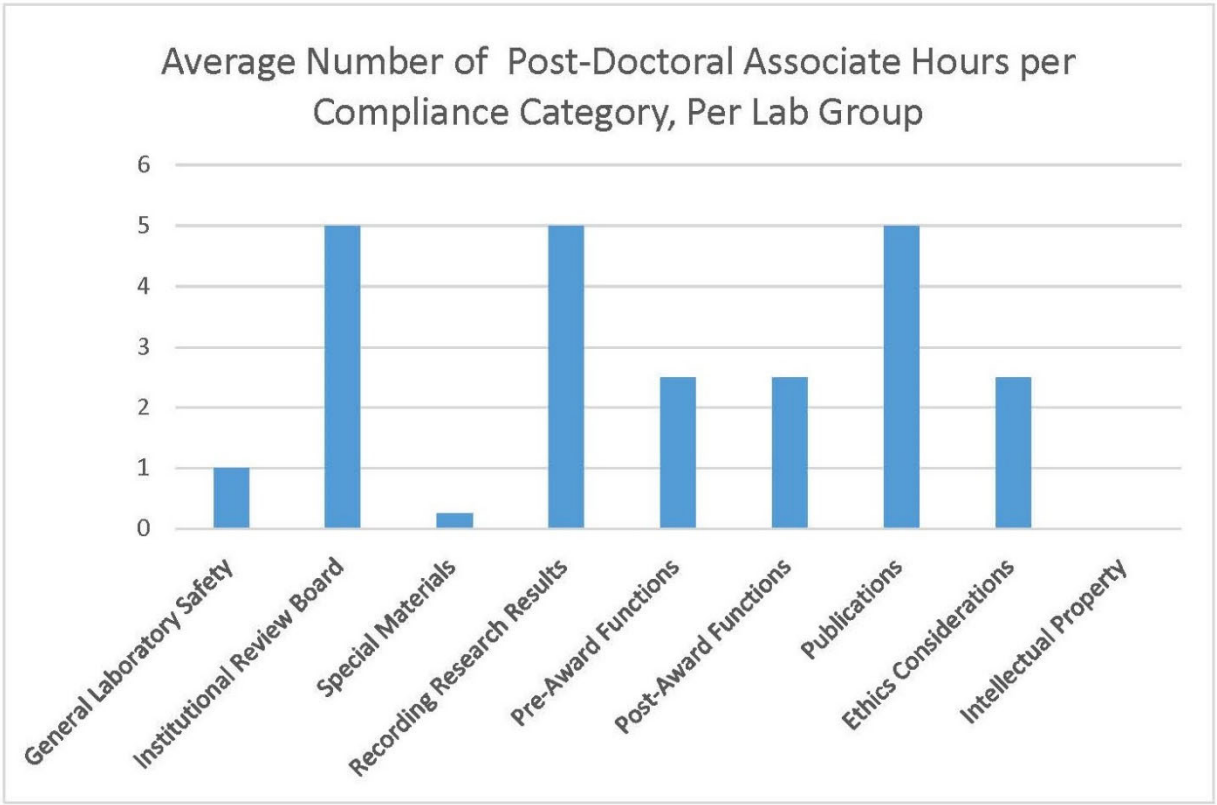
The average time spent by post-doctoral associates per week on compliance tasks had to be based on a single response, and one cannot readily assume that this is representative of the entire classification. The figures reported were 95 hours for the group; the research group size was four people, which provided an average of 23.75 hours per researcher if effort is distributed evenly. Similar to the other categories, this information is provided in **Table 3D** in numerical format and in **Chart 3D** for visual representation.

Table 3D: Time investment based on research role of the respondent – Post-Doctoral Associates

Compliance Category	Average Number of Post-Doctoral Associate Hours per Compliance Category, per Lab Group
General Laboratory Safety	1

Institutional Review Board	5
Special Materials	0.25
Recording Research Results	5
Pre-Award Functions	2.5
Post-Award Functions	2.5
Publications	5
Ethics Considerations	2.5
Intellectual Property	0

Chart 3D: Time investment based on research role of the respondent – Post-Doctoral Associates



Question 3: What research administration tools are available to researchers and are they considered to be helpful? This section of responses were subjective and binary in nature. Was the item proposed available to the researcher? Would it be helpful? This section was based on the records of all 61 respondents.

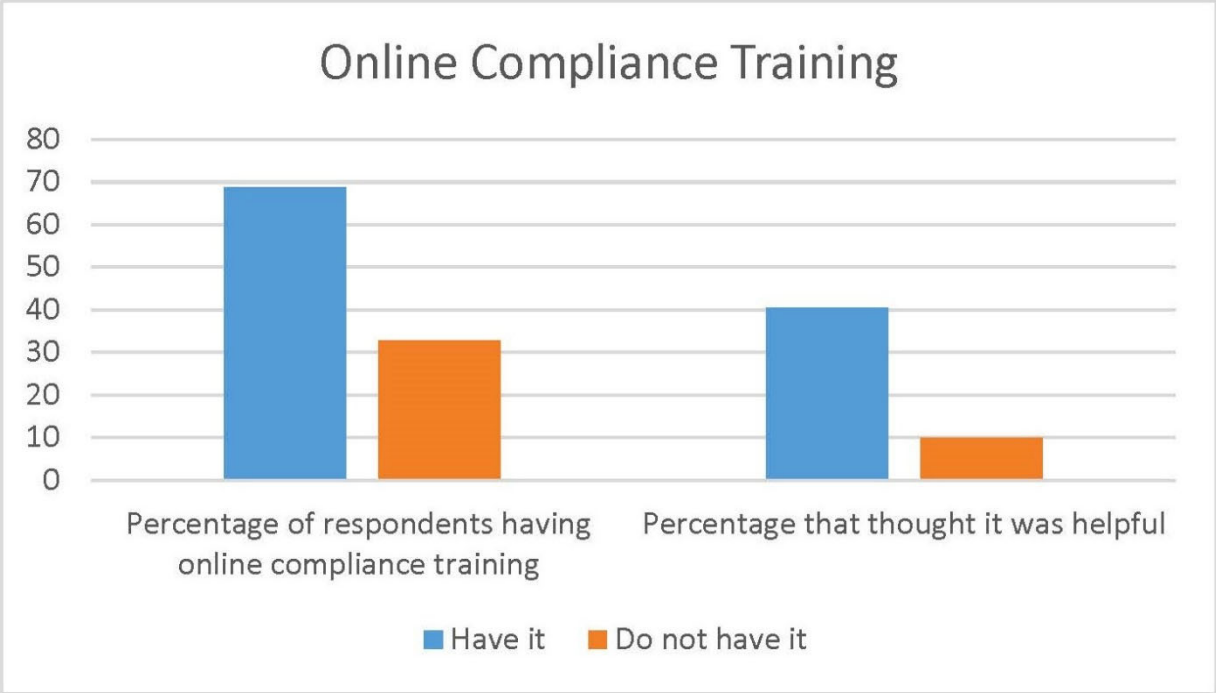
68.85 percent of the respondents had online compliance training in some area, and 40 percent of this group found that it was helpful and/or necessary. Of those that did not have

online compliance training (32.78%), only ten percent thought it would be helpful or necessary, as seen in **Table 4A** in numerical format, and in **Chart 4A** for visual representation.

Table 4A: Availability of online compliance training

Response	Percentage of Respondents having online compliance training	Percentage that thought it was helpful
Have it	68.8525	40.4762
Do not have it	32.7869	10

Chart 4A: Availability of online compliance training



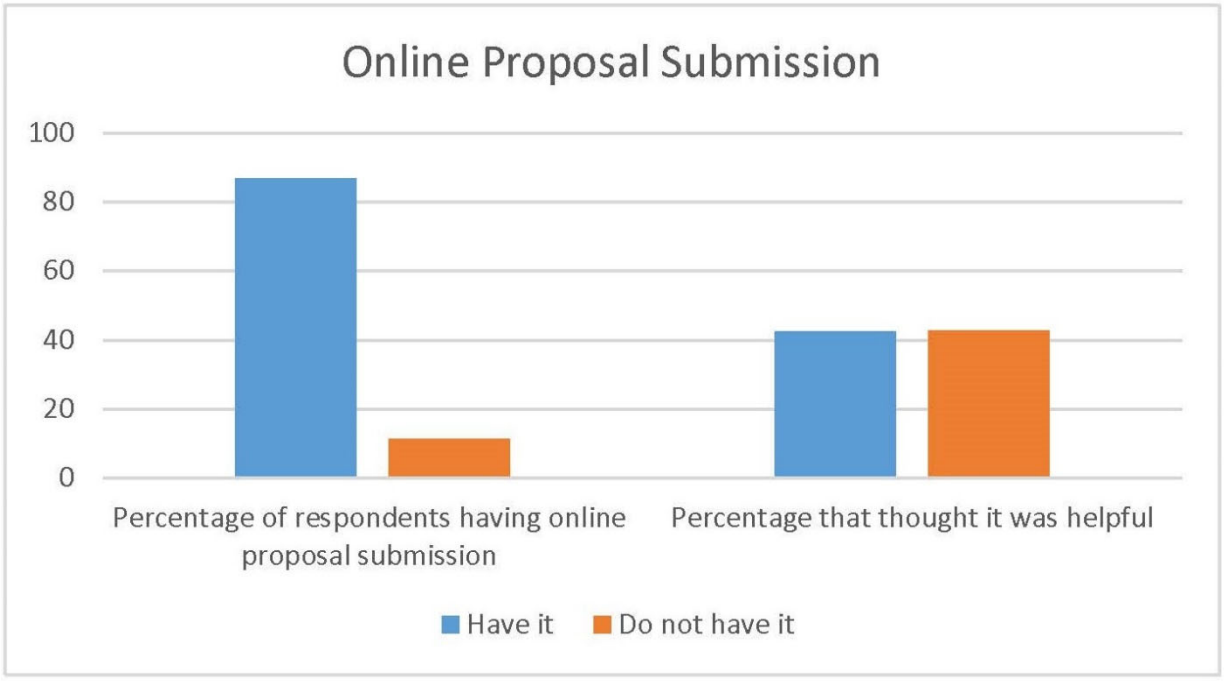
86.88 percent of the respondents had online proposal submission, and 42.59 percent of this group found that it was helpful and/or necessary. Of those that did not have online proposal submission (11.47%), 42.85 percent thought it would be helpful or necessary to institute this amenity, as seen in **Table 4B** in numerical format and in **Chart 4B** with visual representation.

Table 4B: Availability of online proposal submission

Response	Percentage of respondents having online proposal submission	Percentage that thought it was helpful
Have it	86.8852	42.5926

Do not have it	11.4754	42.8571

Chart 4B: Availability of online proposal submission

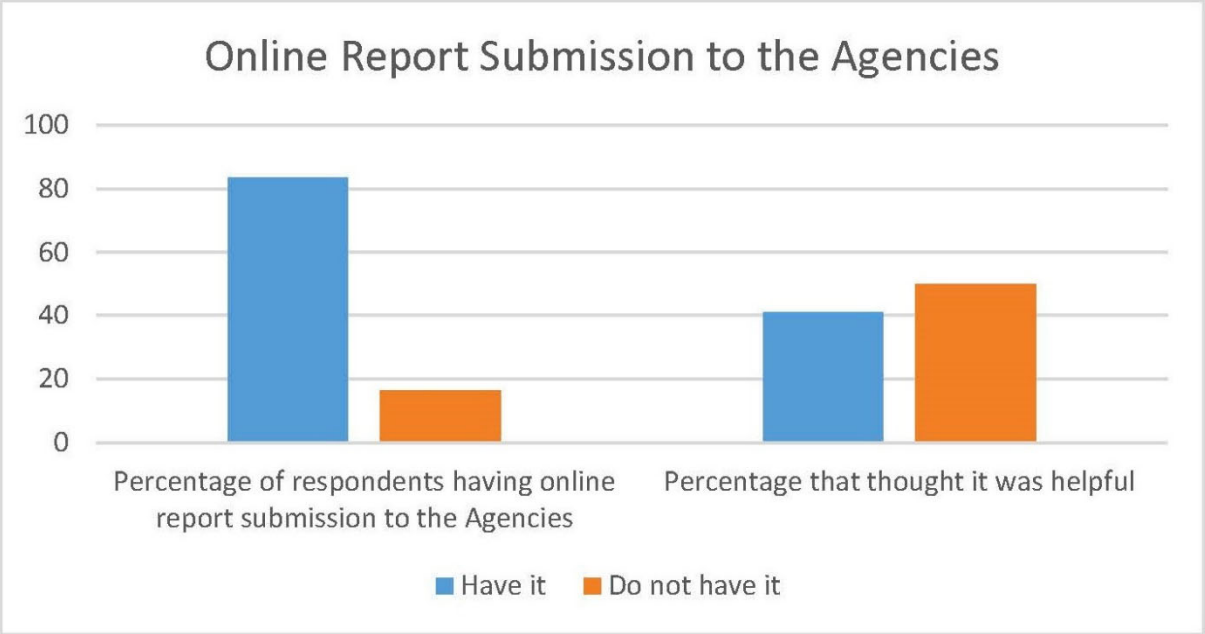


83.60 percent of the respondents had online report submission to federal funding agencies available to them, and 41.17 percent of this group found that it was helpful and/or necessary. Of those that did not have online report submission to federal funding agencies available to them (16.39%), 50 percent thought it would be helpful or necessary, as seen in **Table 4C** in numerical format and in **Chart 4C** for visual representation.

Table 4C: Availability of online report submission to federal funding agencies

Response	**Percentage of respondents having online report submission to the agencies**	**Percentage that thought it was helpful**
Have it	83.6066	41.1765
Do not have it	16.3934	50

Chart 4C: Availability of online report submission to federal funding agencies

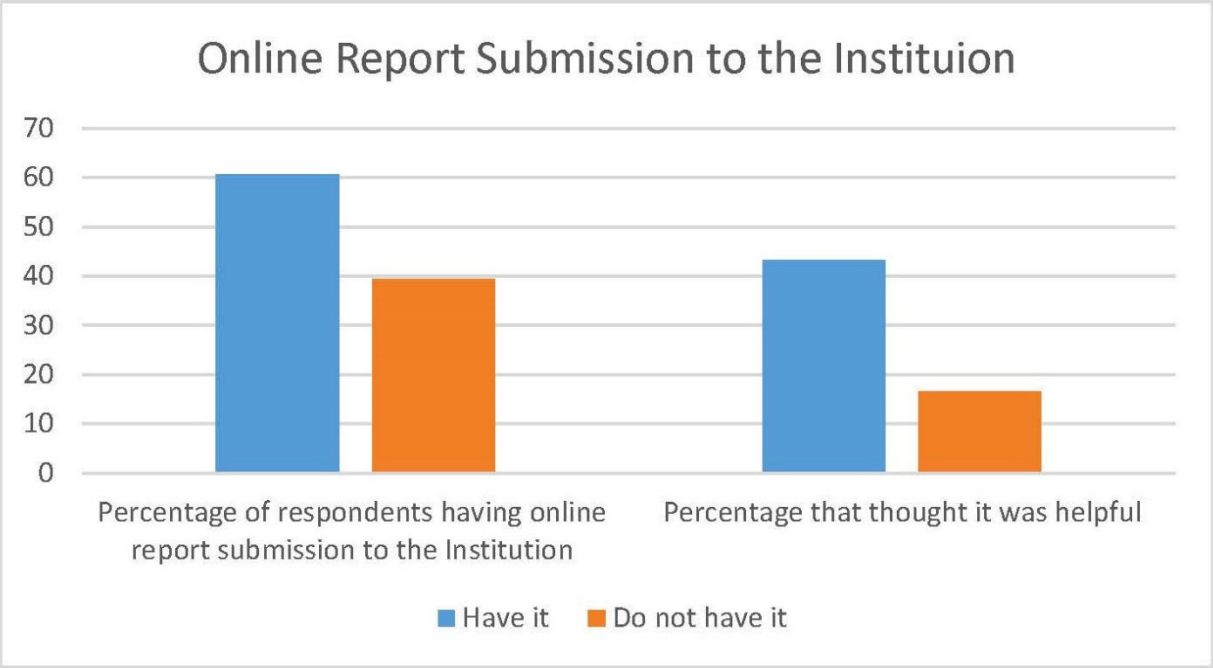


60.66 percent of the respondents had online report submission to their institutions, and 43.24 percent of this group found that it was helpful and/or necessary. Of those that did not have online report submission to their institutions (39.34%), only 16.67 percent thought it would be helpful or necessary, as seen in **Table 4D** in numerical format and in **Chart 4D** as a visual representation...

Table 4D: Availability of online report submission to the respondent's institution

Response	Percentage of respondents having online report submission to the institution	Percentage that thought it was helpful
Have it	**60.6557**	**43.2432**
Do not have it	**39.3443**	**16.6667**

Chart 4D: Availability of online report submission to the respondent's institution

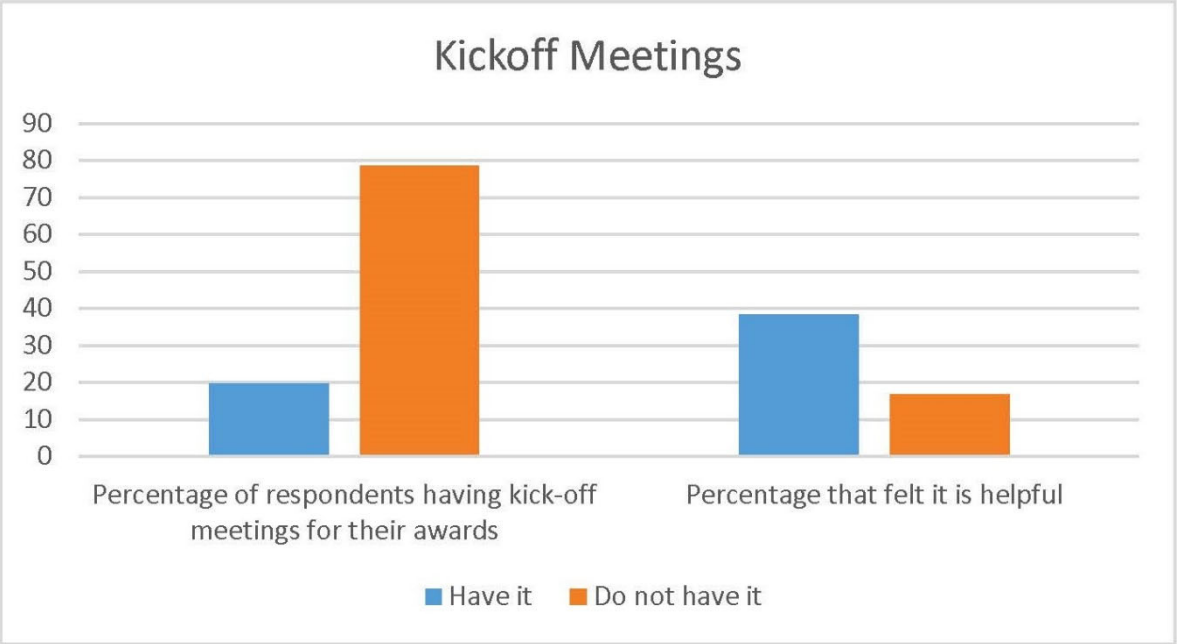


19.67 percent of the respondents utilized kick-off meetings for their awards to discuss terms and conditions, and 38.46 percent of this group found that it was helpful and/or necessary. Of those that did not use kick-off meetings (78.68%), only 16.67 percent thought it would be helpful or necessary, as seen in **Table 4E** in numerical format and in **Chart 4E** for a visual representation.

Table 4E: Use of kick-off meetings for awards

Response	Percentage of respondents having kick-off meetings for their awards	Percentage that felt it is helpful
Have it	**19.6721**	**38.4615**
Do not have it	**78.6885**	**16.6667**

Chart 4E: Use of kick-off meetings for awards

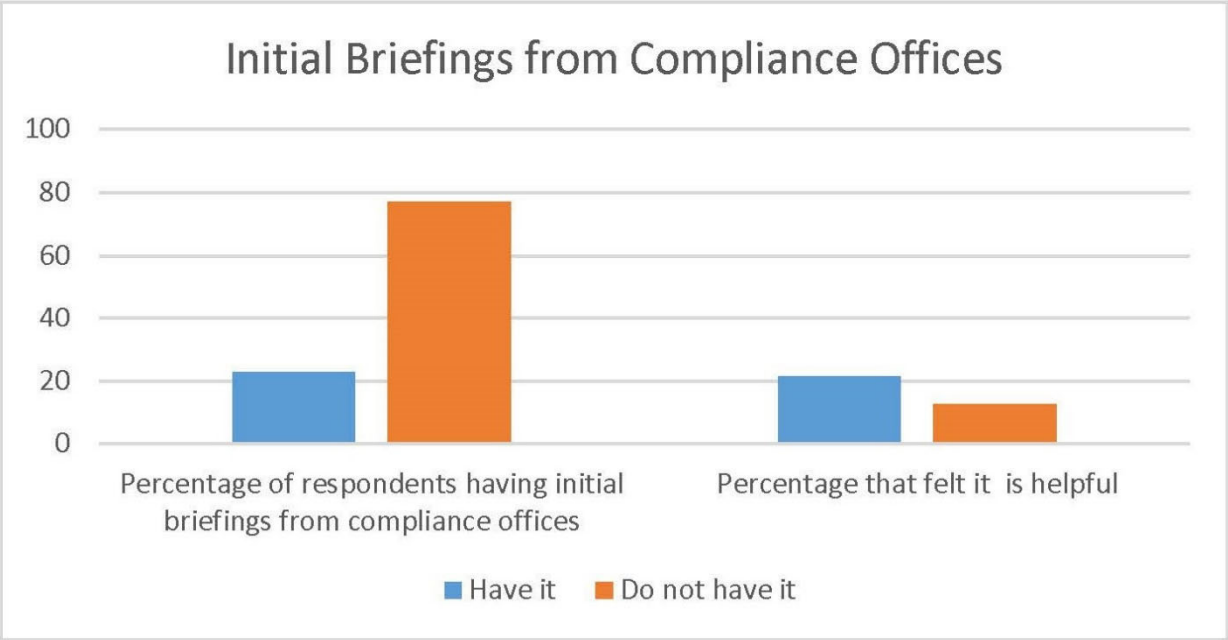


22.95 percent of the respondents had initial briefings from their institutional compliance offices, and 21.43 percent of this group found that it was helpful and/or necessary. Of those that did not have initial briefings from their institutional compliance offices (77.04%), only 12.76 percent thought it would be helpful or necessary, as seen in **Table 4F** in numerical format and in **Chart 4F** as a visual representation.

Table 4F: Incidence of initial briefings from compliance offices within the institution

Response	Percentage of respondents having initial briefings from compliance offices	Percentage that felt it is helpful
Have it	**22.9508**	**21.4286**
Do not have it	**77.04**	**12.766**

Chart 4F: Incidence of initial briefings from compliance offices within the institution



Question 4: What are the characteristics of the research group demographically?

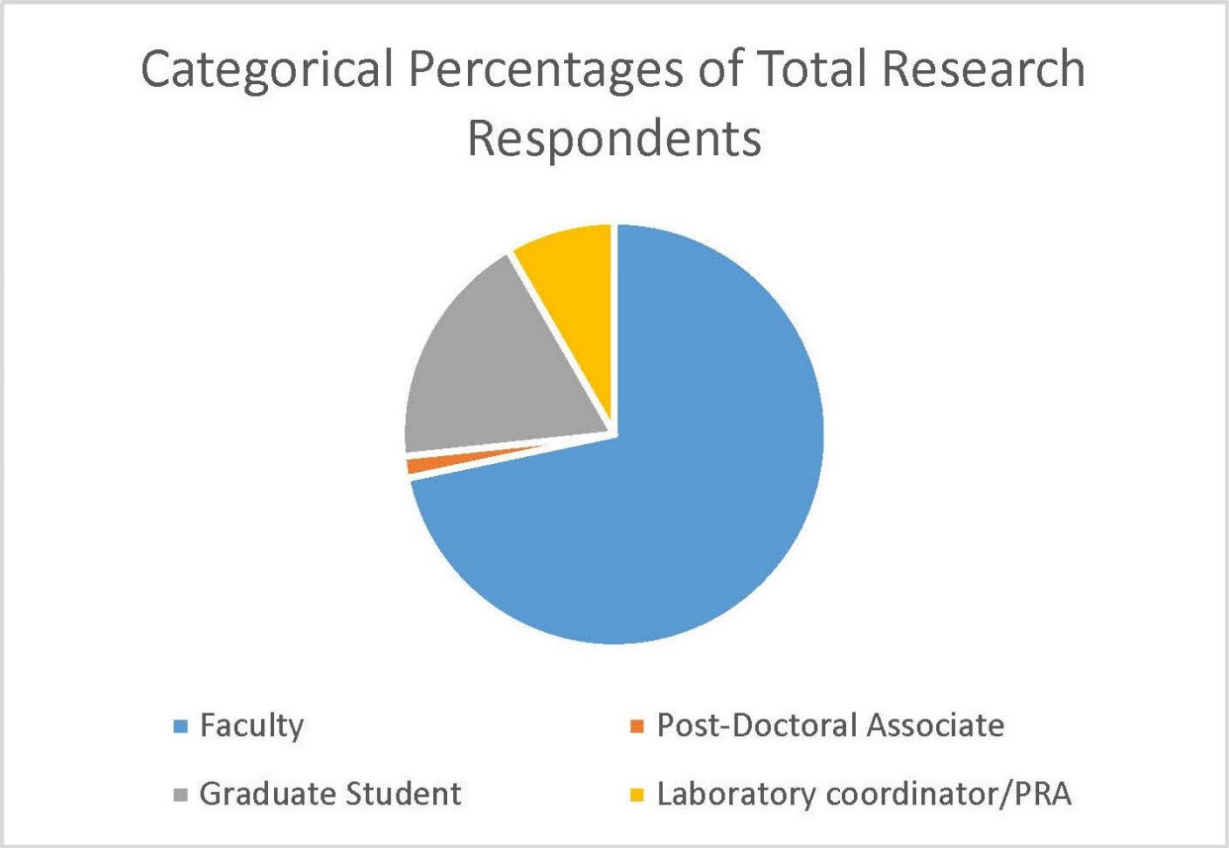
Understanding the demographic characteristics of the group surveyed puts the responses into better context and clarifies the needs of the researchers involved. The following tables and corresponding charts illustrate and clarify our group of respondents.

The largest group of respondents was faculty, at 71.66 percent, over three times as large as the next largest respondent group (graduate students at 18.33%, PRAs at 8.33%, and post-doctoral associates at 1.667%). The percentages of respondent distribution into each of the four researcher categories are shown below in **Table 5** in numerical format and in **Chart 5** as a visual representation.

Table 5: Number of respondents in each research role

Research Role	Categorical percentages of total research respondents
Faculty	71.6667
Post-Doctoral Associate	1.6667
Graduate Student	18.3333
Laboratory Coordinator/PRA	8.3333

Chart 5: Number of respondents in each research role

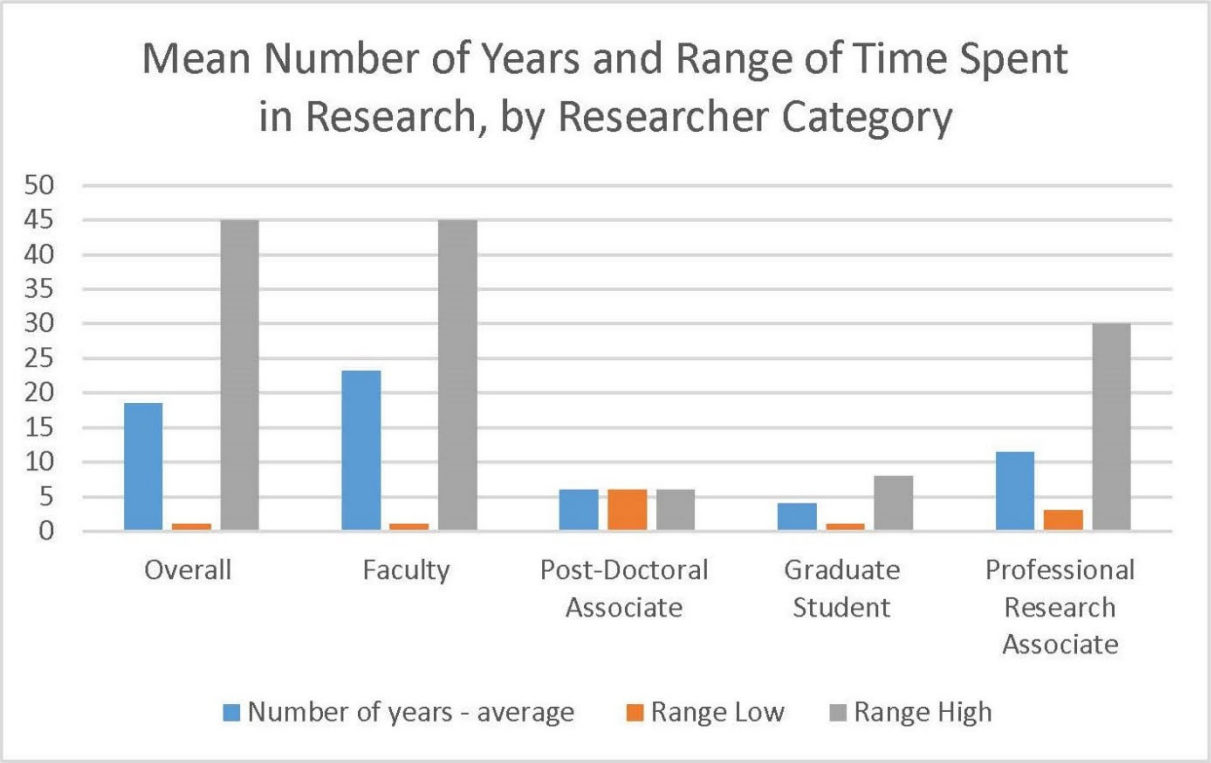


The mean amount of time spent in research for the overall respondent group was 18.52 years, with faculty having an average of 23.11 years, post-doctoral associates having an average of 6 years, graduate students having an average of 4 years, and professional research associates having an average of 4 years. For further comparison, the low and high numbers of the response range have been added in **Table 6** in numerical format, and in **Chart 6** as a visual representation.

Table 6: Mean number of years as a researcher, by respondent group, plus range

Category	Average number of years	Range Low	Range High
Overall	18.5198	1	45
Faculty	23.11905	1	45
Post-Doctoral Associate	6	6	6
Graduate Student	4	1	8
Professional Research Associate	11.4	3	30

Chart 6: Mean number of years as a researcher, by respondent group, plus range



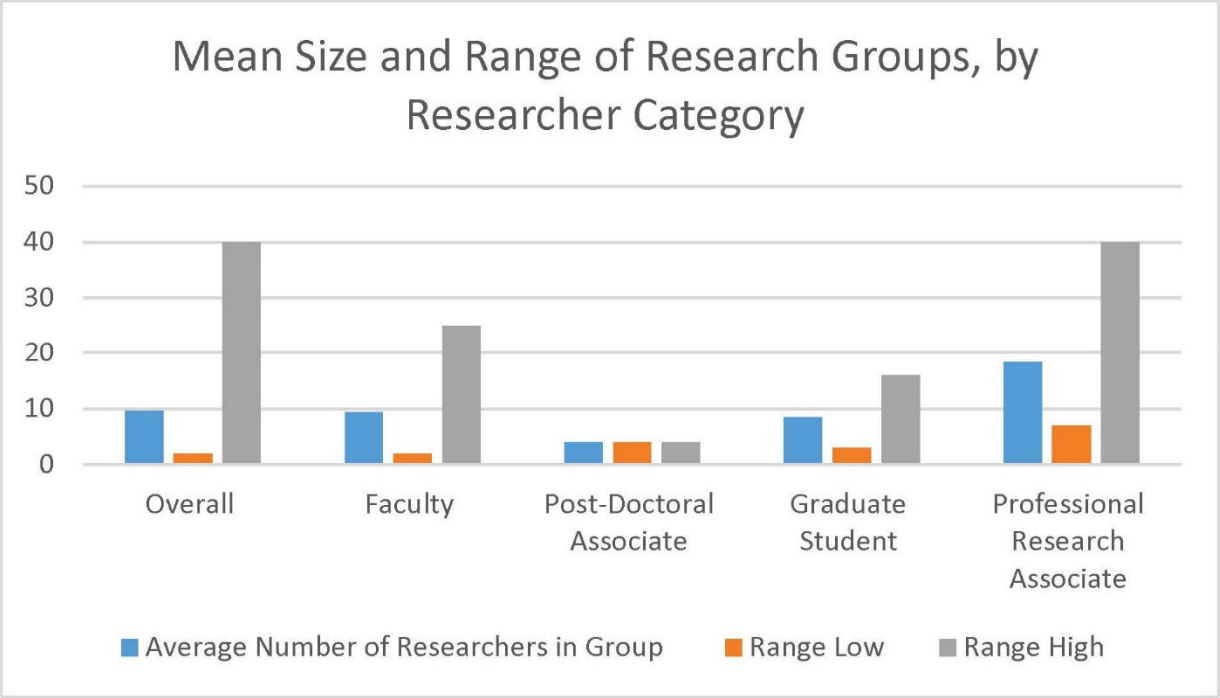
The mean size of the research groups the survey respondents are involved with for the overall respondent group is 9.508 people, with faculty having 9.285 people, post-doctoral associates having four people, graduate students having 8.454 people, and professional research associates having 18.33 people as mean figure for research group size. For further comparison, the low and high numbers of the range have been added in **Table 7** in numerical format and in **Chart 7** as a visual representation.

Table 7: Mean size and range of research groups

Category	Average number of researchers in group	Range Low	Range High
Overall Group	**9.508772**	**2**	**40**
Faculty	**9.285714**	**2**	**25**
Post-Doctoral Associate	**4**	**4**	**4**
Graduate Students	**8.454545**	**3**	**16**

Professional Research Associate/Technician	**18.33333**	**7**	**40**

Chart 7: Mean size and range of research groups

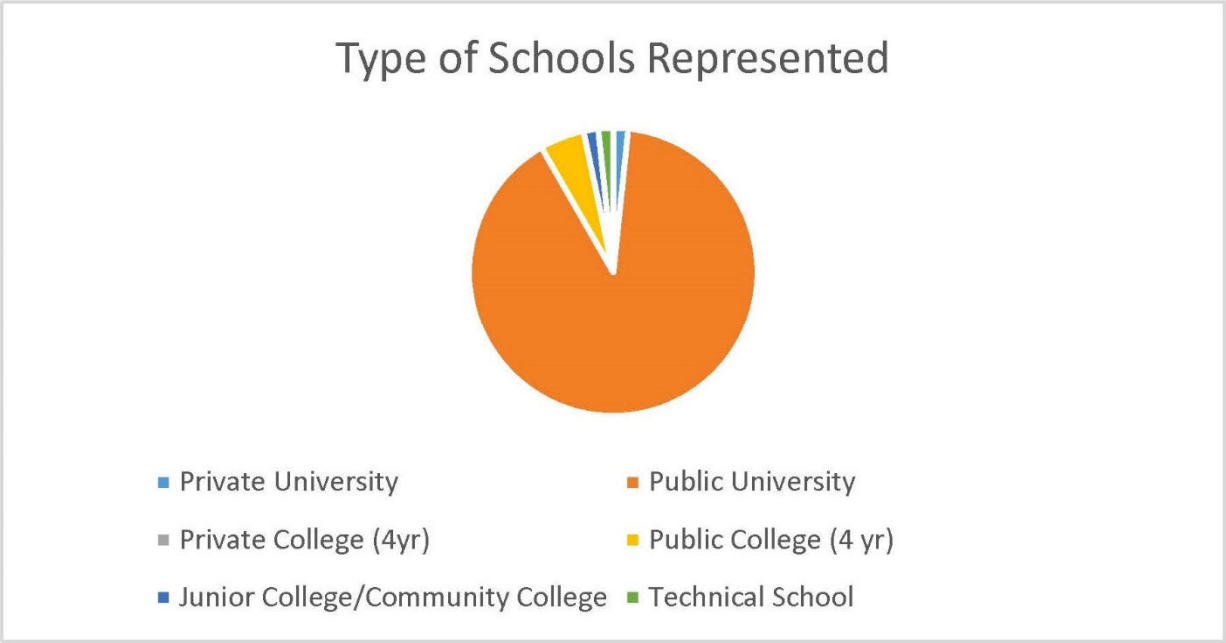


Responses from public universities were overwhelmingly dominant at 90 percent, with the other categories making up the remaining ten percent (public 4-year college, 5%, private university 1.667%, junior college/community college 1.667%, and technical school 1.667%). The percentages of respondent distribution into each category are shown below in **Table 8** in numerical format and in **Chart 8** for visual representation.

Table 8: Type of schools represented

Description	Percentage of school type represented
Private University	**1.6667**
Public University	**90**
Private College (4 year)	**0**
Public College (4 year)	**5**
Junior College/Community College	**1.6667**
Technical School	**1.6667**

Chart 8: Type of schools represented



The next section of data collected were subjective responses of a non-binary nature, and all 61 records were included in this evaluation. This section reports how many records responded to the question, and how many comments in total were offered. It is interesting to observe that some records responded with comments for more than one area, and thus these are listed as separate comments. The general areas classified were institutional issues, duplication and irrelevance, agency issues, technical and web issues, and other issues. Within the discussion of the specific comments, they are cited with a record number (e.g. record 8, or records, 3, 7, 14).

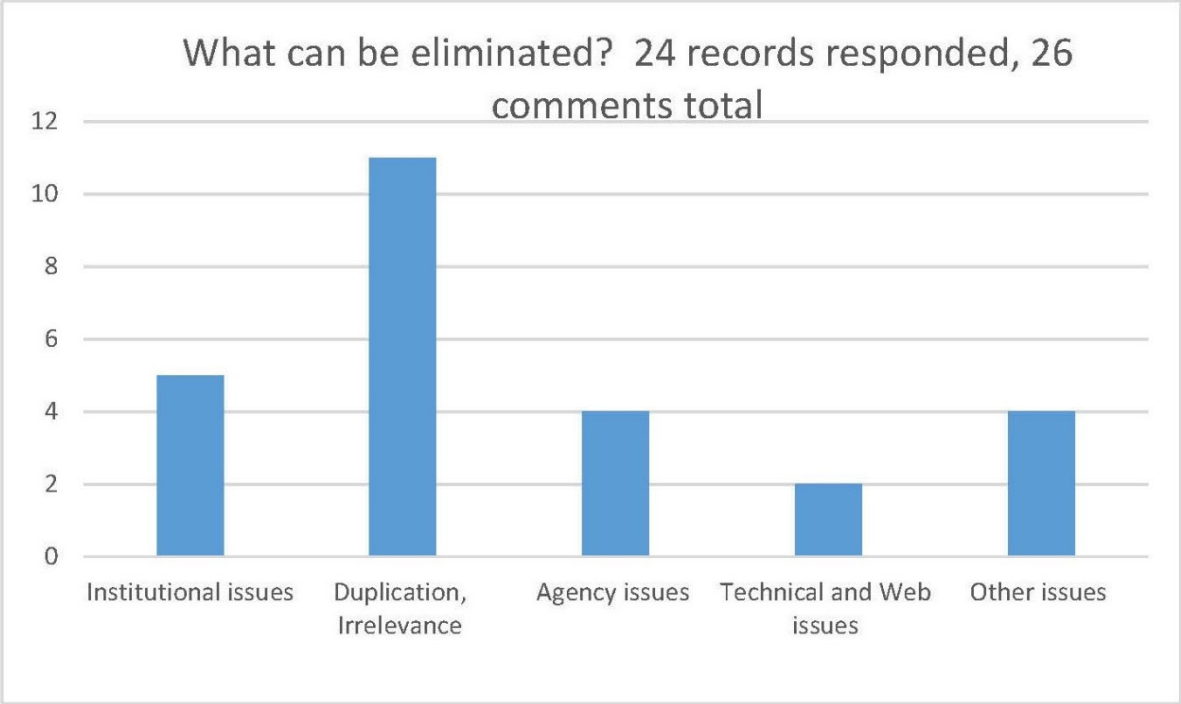
Question 5: What can be eliminated? Twenty-four respondents provided twenty-six comments; the highest three categories were duplication and irrelevance (11 comments), institutional issues (5 comments), and agency issues (4 comments). This is illustrated in **Table 9A** in numerical format, and in **Chart 9A** as a visual representation.

Table 9A: Recurring themes in subjective comments – what can be eliminated?

Theme	**How many comments?**
Institutional issues	**5**
Duplication and Irrelevance	**11**
Agency issues	**4**

Technical and web issues	**2**
Other issues	**4**

Chart 9A: Recurring themes in subjective comments – what can be eliminated?

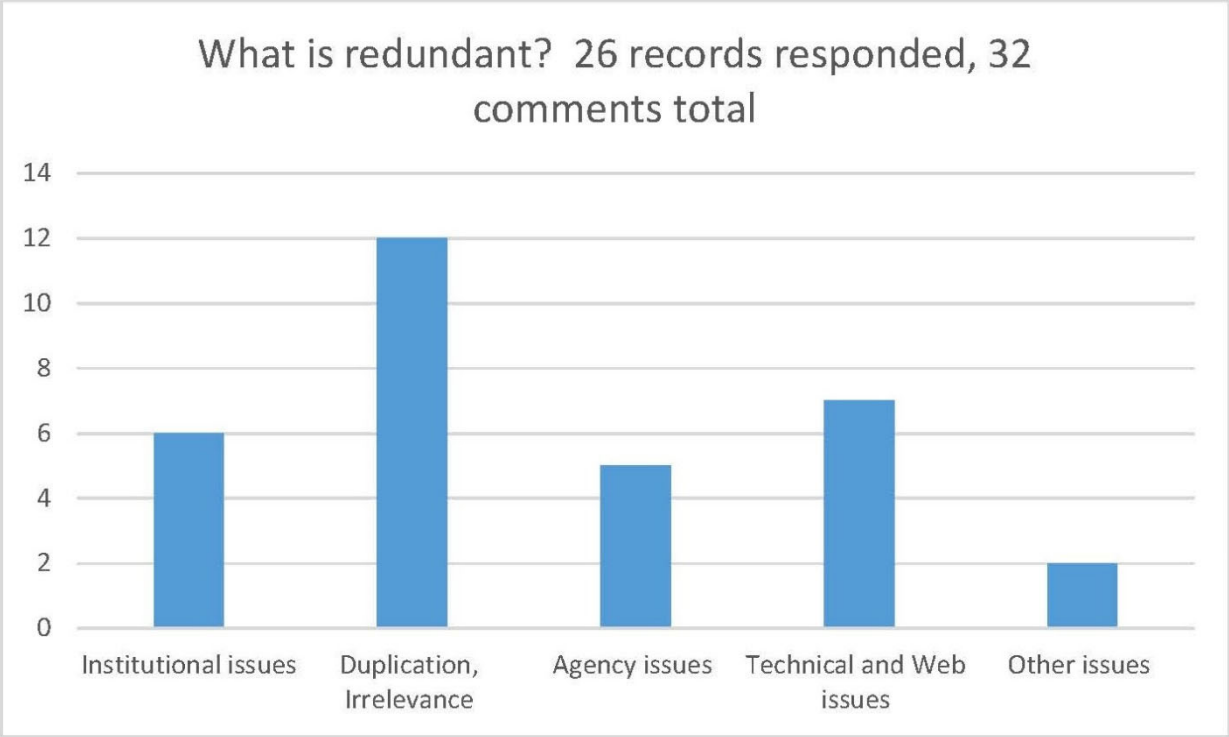


Question 6: What is redundant? Twenty-six respondents provided thirty-two comments; the highest three categories were duplication and irrelevance (12 comments), technical and web issues (7 comments), and institutional issues (6 comments). This is illustrated in **Table 9B** in numerical format, and in **Chart 9B** as a visual representation.

Table 9B: Recurring themes in subjective comments – what is redundant?

Theme	How many comments?
Institutional Issues	**6**
Duplication and Irrelevance	**12**
Agency issues	**5**
Technical and web issues	**7**
Other issues	**2**

Chart 9B: Recurring themes in subjective comments – what is redundant?

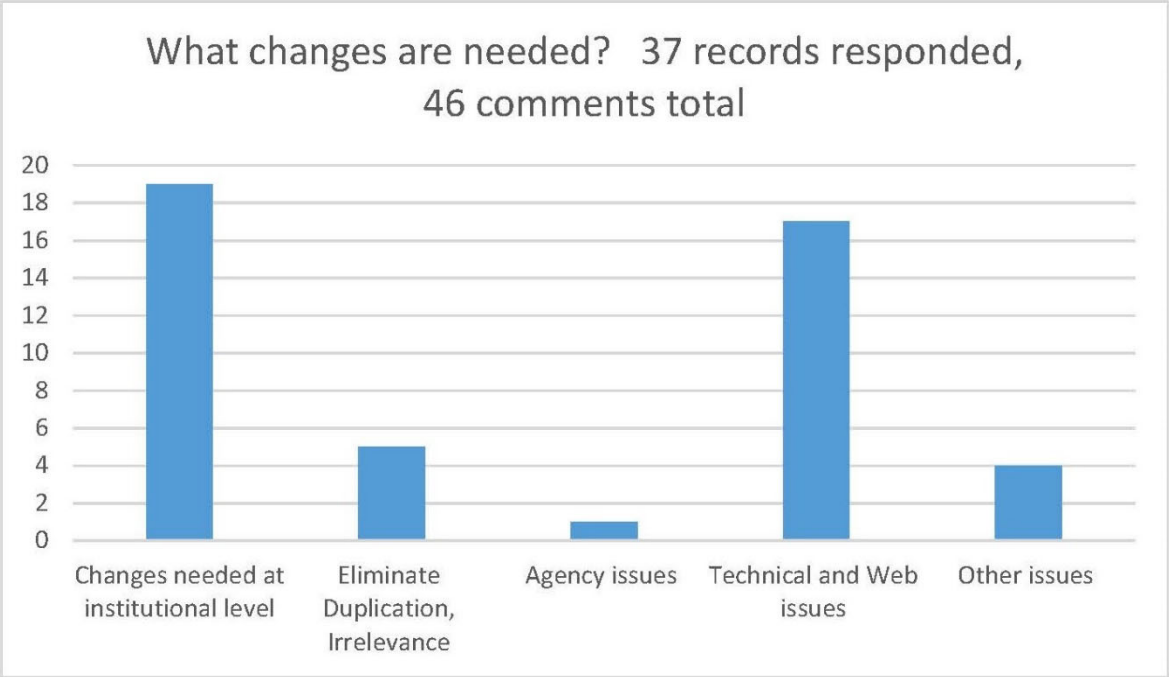


Question 7: What changes are needed? Thirty-seven respondents provided forty-six comments; the highest three categories were changes needed at institutional level (19 comments), technical and web issues (17 comments), and duplication and irrelevance (5 comments). This is illustrated in **Table 9C** in numeric format and in **Chart 9C** as a visual representation.

Table 9C: Recurring themes in subjective comments – what changes are needed?

Theme	How many comments?
Changes needed at the institutional level	19
Eliminate duplication and irrelevance	5
Agency issues	1
Technical and web issues	17
Other issues	4

Chart 9C: Recurring themes in subjective comments – what changes are needed?

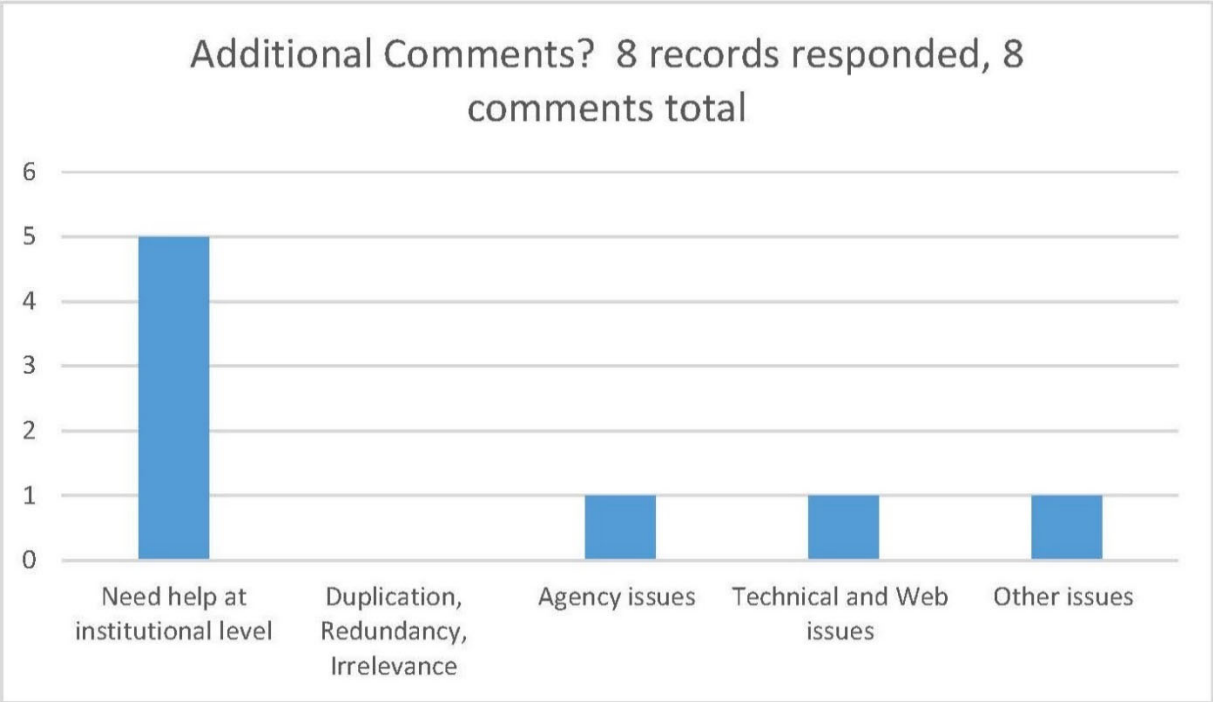


Question 8: What are the additional comments? Eight respondents provided eight comments; the highest category was that assistance is needed at the institutional level (5 comments). This is illustrated in **Table 9D** in numerical format and **Chart 9D** as a visual representation.

Table 9D: Recurring themes in subjective comments – are there additional comments?

Theme	How many comments?
Need assistance at the institutional level	**5**
Duplication, Redundancy, and Irrelevance	**0**
Agency issues	**1**
Technical and web issues	**1**
Other issues	**1**

Chart 9D: Recurring themes in subjective comments – are there additional comments?



3.22 Results Discussion: To recap the data analysis process, the survey received 61 responses between June 27, 2019 and July 15, 2019. The results were directly reported from the REDCap system into MS Excel. After consultation with Professor Kantor and Dr. Daniel Dvorkin of the University of Colorado Health Sciences Center Altitude Research Center, the following data points were excluded from analysis:

1) Record number 1 was deemed an ineligible response due to what appears to be multiple input errors and an improbable amount of time per week spent by each lab group member on compliance tasks.
2) Record number 7 was deemed an ineligible response due to what appears to be multiple input errors and an improbable amount of time per week spent by each lab group member on compliance tasks.

3) Record number 18's entry of a 20,000-member research team is likely an input error; due to the sheer improbability of a research team that large as well as it not matching the figures in the weekly time categories.
4) Record number 37's entry of a 500-member research team is also likely an input error for the same reasons stated in relation to record 18.

Mean values and standard deviations for all numerical categories except the research group size were calculated based on 59 entries. Mean values and standard deviations for the research group size were calculated based on 57 entries.

For the overall group if the figure of 27.79 hours per week is measured against a 40-hour workweek, the percentage of time on compliance functions is 69.48 percent. This is far in excess of the 44 percent cited in the 2018 FDP results (Schneider, 2019). The four top time drivers within the compliance tasks are recording research results (12.05%), pre-award functions (23.54%), post-award functions (15.14%), and publication (33.57%). Given that the average number of total weekly hours spent on compliance per lab group was 27.79492 hours and the average size of the research groups responding to this survey is 9.508772 people, the average time spent per researcher comes to 3.836496 hours, or 9.59 percent of a 40-hour workweek. This also does not closely correspond to the 44 percent stated in the 2018 FDP survey results.

As with the overall group breakdown, the top four time drivers are recording research results, pre-award functions, post-award functions and publications. Faculty time expenditure is slightly less than the average of 3.35 hours per week (at 2.72 hours per week), and slightly more than the averages of the other three categories (6.54 overall group versus 7.42 faculty, 4.21 overall group versus 4.67 faculty, and 9.33 overall group versus 10.51 faculty respectively).

The primary time drivers are the same for the graduate students as the overall group, but at a lower time investment than either the overall or faculty expenditures. Recording research results are 2.44 hours, pre-award functions are 2.59 hours, post-award are 1.73 hours, and publications are 5.45 hours per lab group per week. It is also interesting to note that graduate student respondents reported the highest average time investment for the special materials category of all four groups, at 1.73 hours per lab group per week.

As with the other groups, the same four time drivers took the most time for professional research associates and technicians. Recording research results, pre-award functions, and post-award functions taking more time than the overall group (3.35 overall group versus 7.3 professional research associates, 6.54 overall group versus 7.2 professional research associates, and 4.21 overall group versus 4.6 professional research associates, respectively); and publication taking less time than the overall group (9.33 overall group versus 5.8 professional research associates). It is interesting to note that the Professional Research Associate/Technician category had the highest time investments in lab safety (1.37 overall group versus 1.5 professional research associate) and in ethical considerations (.83 overall group versus 1.52 professional research associate) of any group, as well as exceeding the average figures for the overall group in these two categories.

There was a great many items that respondents felt could be eliminated from administrative tasks. In the area of duplication and irrelevance, respondents felt that they received duplicate information requests from multiple campus offices (record 8, subjective comments) and that the same forms had to be filled out repeatedly (record 13, subjective comments) when basic information could be inserted via an auto population function (name, department, contact information, etc.). Additionally the respondents found that frequent

reporting with no changes to the same subjects within a project took significant time (records 18, 31, 52, and 59, subjective comments). Online trainings are standard for each separate subject, and are not tailored to the needs of the individual researcher. There is a great deal of training that is duplicated, and a great deal of material that comes up as unnecessary or irrelevant to the particular research project or research group (records 36, 42, 43, and 46, subjective comments).

Respondents felt that their efforts with financial management and reporting were duplicative in nature, especially with those institutions that have departmental and central financial reporting structures. Post-award support is needed to assist principal investigators and research groups in the area of financial management and reporting (records 2, 23, and 24 subjective comments). One comment suggested that each lab group be assigned a single person as a contact for all compliance issues, so that all information comes from one source (record 35, subjective comments).

Additional duplication and conflict also came up between the agency and the institutional requirements; agency administrative branches conflict with each other (8, 16, and 19, subjective comments) and frequently require duplicate reports. One respondent reported that there were requests from the institution that directly conflicted with agency protocols and the time taken to justify non-standard items is a problem (record 31, subjective comments).

While technological innovations have helped with significantly reducing time investment, there are still improvements needed. Some people are not clear on what is an online compliance function or how/where/when to use online training available to them (record 20, subjective comments). Another technological issue is that online forms are difficult to use, that repeated manual input of information is required, and that the process is too slow (record 25, subjective comments). Other respondents would like to see integration and importing of compliance

requirements into shared calendars and timetables in order to notify the group of various deadlines and reports (record 35, subjective comments).

There is significant redundancies that can be eliminated. Respondents reported that they invested significant time adding the same information to multiple forms, systems, and internal tracking methods (records 8, 23, 24, and 25 subjective comments), as well as having to submit frequent reporting with no changes. These duplications were submitted not only with safety and data management at the institutional level but also with agency reports (records 18 and 31, subjective comments). Additionally, respondents need to report the same information to both government and institution in different formats (records 36 and 60, subjective comments) which is another time investment that can be avoided.

While technological innovations such as online compliance training, websites, and reporting engines are providing some reduction in time investment for proposals and reporting, improvement is needed. Websites and reporting engines require differing formats, manual input of information each time, and are not user friendly. They do not import information from publication databases for proposal preparation, interim reports, and final reports (records 13, 16, 24, and 25, subjective comments). Additionally reported was that the compliance refresher quizzes and recertification after initial compliance training is complete need to be more user friendly and tailored to the specific needs of the researcher (record 45, subjective comments).

At the institutional level, there are many administrative functions that require expertise in other areas than the area of research (finance, export control, property management, etc.). The duplication of effort between researchers and staff needs to be reduced (records 2, 33, 39, 43, 49, and 50, subjective comments).

At the agency level, respondents felt that reports are required too frequently and the respondents are unsure if these reports are even read or acted upon (records 9, 31, 52, and 57, subjective comments).

The responses to the question of what needs to change showed interesting results. Overwhelmingly the respondents asked for more assistance in compliance and administrative tasks, as this is not their area of expertise (records 2, 10, 12, 23, and 24, subjective comments). Many respondents noted that the level of coordination and customer service from compliance entities at the institutional level needs improvement; further efforts are needed to avoid duplication of effort and to speed up processing (records 12, 13, and 19, subjective comments). Additional improvement is needed in communication lines to researchers from compliance entities; respondents felt they were uncommunicative, unhelpful, and did not have an understanding of the needs of the particular research group (records 12, 13, 23, 24, 25, 31, 39, and 43, subjective comments).

In the area of technical development, the strongest need is to have online tools that are intuitive, easy to use, and can be tailored specifically to the needs of the researcher (records 8, 13, 27, 32, 43, and 44, subjective comments). Information must be simple to locate, and reports easily generated (records 27, 44, and 48, subjective comments). Web based compliance training was also desirable (records 33, 45, and 46, subjective comments) as well as project management software that allowed secure file sharing, calendar functions, and central reporting functions (records 20, 35, and 44, subjective comments).

Respondents also stated that there should be less redundancy at the PI and department level, when the institution and agency reports cover the same information (record 10, subjective comments). Additionally they request that the university staff they interact with are coordinated

in their efforts to avoid having to duplicate reports and information (record 13, subjective comments).

There was also input from the additional comments section, although the percentage of response was relatively low. The assistance needed by the respondents at the institutional level is significant – they would like to have departmental staff to assist them with reporting and compliance tasks (records 19, 23, 31 and 43, subjective comments). Record 19's comment in this section suggested that enabling budget for these tasks to be carried out by non-research personnel (with ostensible expertise in these fields) is a possible solution to part of this problem.

Additionally the high time investment for proposal construction and submission is frustrating to researchers, especially considering the high percentage of variability in documents and formatting required by each agency and the extremely low award rate (record 50, subjective comments) for grant proposals.

The data were considerable in scope and nature, and it took some time to put it into context to prepare for constructing the best practices discussed in the next section of this thesis. In revisiting the specific questions, the data provided the following perspectives:

- The primary time drivers for compliance functions were administrative in nature. The data sets show that the main time drivers for compliance functions are results reporting and publication duties, pre-award functions including proposal preparation and submission, obtaining matching funds, internal approvals, and budgeting; and post-award functions including technical and financial reporting, financial management, records, and administrative reporting. There was some variation based on research role, and the professional research associate/technician group had considerably more time in recording research results than the other groups but their reporting also showed similar

concentration in the top three areas mentioned above. Respondents reported that online compliance training was available, and sometimes helpful; those that did not have it felt it might be helpful and save time. Online proposal submission engines are widely used (86.88%) and deemed useful by over 40 percent of respondents, whether they do or do not have it available to them. Likewise, online submission of interim and final reports is widely used (83.6%), and deemed beneficial by the respondents (41.17% by those that have it, and 50% by those who do not). Online report submission to the institution itself was not as prevalent (60.66%), and the respondents were somewhat split on the question of its efficacy (43.24% for those that do, and 16.66% for those that do not). The data sets that I found surprising were in the last two questions. Only 19.67 percent of respondents had kick-off meetings for awards, and a surprisingly low percentage of all the respondents thought they might be helpful (38.46% of those that did have it, and 16.67% of those that did not). 22.95 percent of respondents had initial briefings from institutional compliance offices, and only 21.43 percent of those that did have them and 12.76 percent of those that did not found them to be of use.

- Compliance activities are not thoroughly understood by those that need to accomplish the duties. Considering the high mean time spent in research of 18.52 years among all the respondents, both the incidence and the content of the subjective comments showed that there is a lack of understanding of not only the compliance activities themselves; but also why they need to be done, who should be doing them, what training should be done, and how that training should be done.
- Compliance activities at the institutional level are often duplicative and redundant in nature. While not shown in the numerical data sets, the subjective comments show

considerable frustration with duplicative and redundant activities in the areas of progress reports, safety reports, online training, and overlapping or duplicative duties with the various compliance service centers (department, central administrative, safety, financial, etc.). Respondents reported that reports to the institution and the funding agencies were often duplicative, but in different format requirements which constituted an additional time expenditure. Additionally there is an instance of a request from the institution that directly conflicted with the established agency requirements and protocols, which should be avoided at all costs.

- While some compliance activities are relegated to junior members of the laboratory groups who have less experience and training in these areas, it is not as widespread as was originally thought. With the blind reporting structure of this survey and only the categorization of the respondents into research roles and types of institutions, the time expenditures shown do not support the assumption that compliance duties are increasingly "dumped" upon junior research group members. With the data sets collected, faculty hours spent overall on compliance were 3.78 hours per week, and the graduate student group averaged 2.09 hours. Indeed, the professional research associates and technicians who are by nature more trained in compliance and safety issues spent the most time of all of the groups on compliance activities, averaging 4.37 hours per week. While the apocryphal stories of being locked in the laboratory until tenure is achieved are commonplace, the differences in time spent from these data are not significant enough to support this claim.

3.3: Best Practices: Based on these data provided, here are some possible best practices for reducing time investment in compliance measures.

Recording Research Results, reducing an overall group average of 3.35 hours per week (Table 2):

- Research groups should be encouraged to utilize portable technology options to record observations in the lab environment and feed data directly into data acquisition hardware (Worzala, 2019). Online entry of data constitutes a significant reduction in time investment that should be developed and expanded.
- There should be investigation and development of data analysis and bioinformatics software that is more end-user friendly, as evidenced in the responses from the subjective questions. Bioinformatics involves advanced software that can be used to analyze very large data sets and spot trends of time delay, scope creep, and a shift of data trending toward various conclusions over time. Consultation with bioinformatics specialists can provide direction for which applications are most effective with various types of research. Training opportunities in these analytic tools that are tailored for the specific research need should be encouraged and expanded. New amenities should be carefully evaluated to determine their impact on administrative burden, whether it is for faculty or administrative staff (Worzala, 2019).

Pre-Award Functions, attempting to reduce the overall group time investment of 6.544 hours (Table 2):

- Departments should be encouraged to utilize at least one full-time staff person to assist with pre-award functions, depending upon the rates of pre-award submission for the particular work unit. This person should concentrate solely on pre-award functions and serve as a liaison between faculty, the department, and the central contracts and grants office (record 39, subjective comments).

- The central contracts and grants office should offer educational and informational opportunities on-line focused on the topics of effective grant writing, agency requirements, how to create budgets, and the current acceptance rates for proposals at various agencies. These should mesh with college and department news bulletins to gain wider exposure (record 39, subjective comments).
- At the college level, administration should offer on-site opportunities for grant-writing and budgeting workshops focused to benefit newer researchers.
- Agencies should be encouraged to use an expedited pre-proposal format that requires less intensive preparation and documentation. Once screened, the proposal can go forward with a full application (record 50, subjective comments). This has been piloted at the National Science Foundation in one of its divisions (GAO report, 2016), by reducing the number of proposal pages and simplifying the documents required. According to the same Government Accountability Office report, NSF leadership has also instituted an agency-wide review to identify pre-award streamlining efforts.

Post-Award Functions, attempting to reduce the overall time investment of 4.20 hours per week (Table 2):

- Institutions should realign their data storage to allow for retrieval and importing of information from central data repositories, including publication information. Reports could be run from this central data repository for all compliance offices, which will cut down on the need to construct duplicate and/or similar reports to each office (records 8, 13, subjective comments).
- There is a significant need to develop online forms and enable auto-population of online forms with basic contact information from a central database (record 13, 24, and 25,

subjective comments). These forms should be tailored to the needs of the researcher (record 39, subjective comments) and could use branching logic to either expand or hide relevant and non-relevant areas to the researcher. An example of a program that can create online forms such as these is REDCap (REDCap, 2019).

- Institutions should restructure their cyberinfrastructure to accommodate integration of systems that must provide data for post-award functions.
- Institutions should be encouraged to reallocate FTE and suitable resources within the department staff compliments to assist with online reporting functions to the institution, compliance entities, and agencies (record 2, 8, 10, 12, 13, 23, 25, 35, and 50, subjective comments).
- Agencies should be encouraged to institute expedited formats for reporting if there is no change in the basics of reports having monthly or quarterly reporting schedules (record 18, 31, subjective comments). If there are small changes required, allow for these to be approved through a simplified administrative process (Brown, et.al. 2018).

Publications, attempting to reduce the time investment of 9.3 hours per week (Table 2):

- Academia needs to encourage development of an "industry standard" for publication that is user friendly. This industry standard should develop tutorials for importing of citations, especially electronic publications. Once this is established, the academic community can encourage journals and agencies to adopt this standard (records 13 and 16, subjective comments).

Technological advancement/use of technology – reductions in all categories of time investment (Table 2):

- There is a greater need for funding allocations to develop streamlined systems built around central cores of information, as well as the appropriate hardware, software, maintenance, and training programs for streamlined use.
- There needs to be a mindset adjustment regarding technology assistance that centers on human systems engineering – to really fulfill the needs of the various end-users (records 27, 32, 43, 44, and 55, subjective comments).
- More frequent and widespread usage of project-management software that can link in with compliance requirements should be encouraged (records 35, 44, subjective comments).
- Compliance systems need to be able to integrate effectively and import information from each other. Information and forms need to be easily found, cross-referenced, and attached to the various functions that access that information.
- A standard of online forms for applications and authorization needs to be established. These forms should be able to attach to proposals, travel authorizations, financial requests, etc. Using fillable pdf's is time-consuming and needs to be updated to utilize web formats. These forms need to be enabled with auto population and importing of basic information, be tailored via branching logic (radio buttons that expand areas pertinent to the researcher's answers to questions, and need to be exclusively routed via electronic signature software at all levels from internal institutional levels all the way up the agency level approvals.
- Compliance training should be tailored to the needs of the individual researcher. This can initiate at the awarding and project set-up stage, feeding information from the original proposal request form into a central compliance system that can determine what

training is needed based on the research area. It can then cross-check against the compliance training record of the individual researcher, and then tailor training requirements to what they do not have/need to update (records 36, 42, 44, and 46, subjective comments). Additionally more intensive training should be instituted for junior researchers to gain experience for their duties when they are conducting their own research programs (record 30, subjective comments). Brown et.al. suggest that developing a core curriculum of compliance training for new graduate students and professional research associates that covers basic lab safety would be desirable. Then, additional training could be added based on the individual research need (Brown, et.al. 2018).

Communication and harmonization between agencies, to reduce time investment in all categories (Table 2):

- Agencies should harmonize regulation to avoid redundancy and conflicting requirements (Nichols and Wynes, 2018, Optimizing the Nation's Investment, 2016). The AICA (Public Law 114-329, 2017) has started this process. The goal is to eliminate redundancy and ineffectiveness, especially when applied to research conducted in institutions of Higher Education (Research Universities and the future of America, 2012). If communication lines can be expanded between institutions and agencies regarding harmonization of regulation, perhaps this process can be expedited.
- Federal agencies are in the process of standardizing many forms; but it would save considerable time for these forms to be able to be completed online and stored in a central database, updated by the researcher, and then imported into different applications for various agencies (Optimizing the Nation's Investment, 2016).

- Federal agencies have various regulations regarding research protocols, but it would be advantageous to develop a central set of guidelines and protocols that can be accessed and referenced in IRB, IACUC, and hazardous materials applications; as well as standard operating procedures for commonly used activities within research (Brown, et.al. 2018). For those using standard protocols in various research aspects, this resource could reduce the large time investment in various compliance applications; as well as serving as documentation for methodology within grant proposals. This could be done via a Memorandum of Understanding, eventually graduating to overall policy if it is deemed effective.

Communication and harmonization between institution and agencies, to reduce time investment in all categories (Table 2):

- Institutions should ensure that the requirements they place upon researchers do not conflict with the agency requirements.
- To avoid duplication of reporting, the institution should develop a method of importing pertinent data from the reports sent to federal agencies into their compliance databases and analyze from this import to determine that all requirements are being met. If there are discrepancies or issues of non-compliance, then action can be taken.
- The federal government has requested via the American Innovation and Competitiveness act (Public Law 114-329, 2017) a central database for proposer information – including Biosketches, CV's, Licensure and Publications; to simplify and streamline reporting functions (Nichols and Wynes, 2018). If this database could be accepted as a viable source and standard format for these required documents in proposals, substantial time could be saved.

Communication and harmonization between intra-institutional compliance offices, to reduce time investment in all categories (Table 2):

- Institutions need to initiate a study to assess each of their internal compliance offices regarding recording requirements, reporting requirements, communication and collaboration with other compliance offices, and effective use of technology. The goal should be to eradicate duplication and conflicting policies, standardize forms and put them into web format, and to promote more effective collaboration and communication between different compliance offices with related needs.
- The compliance reporting system focus needs to shift to be web-based and integrated institution-wide. A system needs to be developed that tracks compliance training, compliance recording requirements, and reporting requirements, based on the research requirements filled out in the proposal request forms put in for each project at the pre-award stage. This system should generate inspection schedules, reporting schedules, and send out alerts to various entities for fulfillment needs and/or non-compliance issues (Brown, et.al. 2018).
- Compliance entities within an institution should coordinate inspections that contain the same compliance/safety requirements, to cut down on duplication of effort (Brown, et.al. 2018).
- Institutions should encourage its compliance offices to construct effective policies and procedures for documentation, oversight, and reporting of non-standard compliance situations. Along with this development should be encouragement for dialog between the research groups and the compliance entities, so that the most effective program can be instituted (record 31, subjective comments).

Clear communication and training options for researchers, to reduce time investment in all categories (Table 2):

- Having a team well versed in compliance issues and post-award management at the department level (1-2FTE) that can meet individually with researchers to assist them will increase communication and good will (records 31, 36, 39, subjective comments), and perhaps a more proactive attitude toward compliance.
- Providing training options at the college level for pre-award and post-award management at the college level (both online and in person) would increase visibility to researchers.
- Providing clear communication from department, college, and administrative staff to faculty on processing periods and needs is crucial. Better communication and contact venues are needed between faculty and staff in order to decrease time investment and frustration for researchers.

Additional need for staff that can work between research groups and central administration – to decrease time investment in all categories (Table 2):

- At the department/college level, this staff component needs to be knowledgeable in compliance requirements and federal regulations. They also need to be trained in interpersonal communication techniques as well as teaching methods for adult professionals. The person or team covering this duty should have expertise in the various technological systems the institution uses, to assist researchers with training and troubleshooting.
- If staff is needed for individual research groups, these groups should be allowed and encouraged to build in budget items to their proposals that allow the following:

- Professional technicians that handle compliance duties (records 19, 31, subjective comments).
- Specific support for graduate students seeking training in these compliance duties.

4. **Implications for policy and practice:** The implications for policy and practice are substantial, and all levels of the research enterprise need to be able to assess their internal workings as well as interaction with other entities and other levels of the enterprise. The main areas where change can be implemented first are:

- Communication lines between levels of the research enterprise need to be improved, with the mindset that if compliance is truly to be streamlined that policy-makers need to survey their institutions and determine the time-investment that is required to install changes and improvements. What may look efficient at a federal level may not be so once it has come down to the end-user stage within a research project.
- Refinement of web-based tools and forms with auto-population. This innovation will cut down considerable time from nearly every category of time investment, especially if the forms can auto-populate with basic contact information that does not change. It also cuts down error from repetitive keystroke entry, thereby reducing frustration and risk of non-completion of required forms.
- Expansion of technological integration with central data cores. Not only will this save time when pulling information for application forms and compliance forms, but also it allows for all compliance offices to access the same core of information for the elements that they need. This one innovation can reduce the time investment in creating and submitting duplicate reports to multiple offices; simply by having all of the information housed in a single core of information and reports can be created by various compliance entities at the times that they need them. Training schedules can be constructed from this central data core as well, based on the actor's role as well as the specific type of research for the projects in which they work.

- Harmonization of regulation between agencies at the federal level. If standardized forms and formats can be accepted by all federal agencies, the time reduction in both proposal creation and post-award reporting would be substantial. Additionally, the need to ensure that regulations and policies between agencies do not conflict is critical to efficient operation of research programs at institutions, which frequently have research grants with many agencies at any given time.
- Harmonization of regulation and policy for institutions, to match federal agency requirements. To state that institutions must follow federal agency regulations and requirements is obvious; but what is not obvious is that harmonization at the institutional level to avoid conflicting policy and to more closely align their forms, formatting and report structure to that used by federal agency is more of a pertinent goal. If this can be accomplished, review and processing times at the federal agency level can be reduced, thereby creating fewer delays at the institutional level.

5. **Implications for further research:** There are several avenues for taking this research to a higher level; with additional time and exposure, this study could be expanded considerably. The primary thought for this project's continuation is to repeat the experiment with a larger sample size. Conducting this study in the summer when faculty and students are less available was less than ideal; and it would be beneficial to leave the survey open for at least a month to increase sample size as well as the diversity of institutions. Colleagues from six different institutions reported through social media that they responded to the survey, but due to the anonymous nature of the survey it is impossible to tell how diversely spread this sample is. Paired with this is a more in-depth study to determine how the compliance functions are actually spread within research groups, rather than assuming that effort is distributed equally. This avenue may turn into more of a collection of case studies rather than a statistical analysis, but it is a worthy area of investigation. Measures of interest were offered from industry members doing research and development, through networking contacts via social media as well as the industry members of the Membrane Science, Engineering and Technology Center, a National Science Foundation Industry/University Center (mastcenter.org, 2019). Through effective contacts within the I/U CRC community, it would be possible and worthwhile to repeat this experiment focusing on the research and development arms of the industry and university partners and then apply these data to determine how the I/U CRC program can be shaped to better partner with industry. As some of MAST Center sponsors are also National Laboratories and federal research concerns (Sandia National Laboratories, Los Alamos National Laboratories, Defense Threat Reduction Agency, etc.) this type of study could also assist them in further collaborations and provide the program with better direction (NSF 17-516, 2019). Another line of thought that could be investigated is to compare the compliance burdens of our academic

culture in the United States with that of another country (there were inquiries from contacts in New Zealand, Australia, and the United Kingdom). It would be interesting to compare their best practices to ones used in the United States, to see if any can be imported to serve U.S. systems more effectively.

6. **Conclusions:** Improvement is an ongoing process with reduction of administrative burden, and it is an evolving matter that requires constant evaluation in order to remain truly helpful alongside the scientific research enterprise, which it is designed to serve. Investment at all levels of the enterprise—from those that make agency policy through those at the institutions that help interpret and implement compliance, to those that ensure on a daily basis that responsible conduct in research continues—is vital to the process of streamlining the compliance process and reducing inefficiency (Nichols and Wynes, 2018). The scientific enterprise needs to declare the importance of communication and collaborative evaluation to determine what is redundant, extraneous, and time consuming. Policy-makers need to hear from those involved at ALL levels of the enterprise what their needs are, seek to understand those needs, and work to find solutions that reduce waste, fraud, risk, redundancy, duplication of effort, and time investment. Agencies and institutions need to be proactive in our policy, comparing current innovations and processes with their time investments, to determine if it can be adjusted to be more user-friendly. Administrators and investigators need to closely evaluate effort allocations to determine how they can be adjusted to better share present and future workloads. Institutions need to ensure that training programs are proactive, interactive, collaborative, and responsive to the needs of all levels of the research enterprise. All levels of the scientific research enterprise need to invest in and utilize technology to its fullest advantage, integrating systems as much as is possible to provide the greatest degree of service to users. With all of these goals fulfilled, all constituents of the research are served to the best possible advantage.

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Appendices:

Appendix 1: Compendium of Subjective Comments

Appendix 2: Text and HTML versions of Questionnaire

Appendix 3: IRB Approval Letter

Appendix 4: Recruitment Email

Appendix 5: Contact Venue List

Appendix 6: Raw Data Sheet

Appendix 1: Compendium of Subjective Comments

Note: These subjective comments are separated by the question asked in the survey, and are marked with their respective record number in parentheses, e.g. (2). Identifiers within comments have been deleted. Blatant spelling mistakes have been corrected, but grammar remains as it was taken from the original data.

What can be eliminated? 24 Records responded, 26 comments

(2) Financial reporting.

(8) Duplicate information requests from multiple campus offices; inconsistency of federal granting organizations and individual grant/contract/cooperative agreement terms and conditions.

(13) The form from (contract office) that PIs are required to sign for each grant that comes as a separate file when all of the items have already been discussed with an (contract office) designate.

(16) Having to report the number of days each member of the group spent each year in each country. We participate in multiple large collaborations that utilize international facilities, and our funding agency is well aware of this.

(18) Quarterly narrative reporting of performance measures. While we report on performance measure data quarterly, providing the same narrative (because our process doesn't change) is tedious. Each quarter, I'm told to tweak our narrative so it doesn't sound the same each quarter. If your quarterly data is to provide a certain percentage of family planning methods to a specific age group, and each quarter you exceed the goal, why would you need to provide any additional narrative?

(19) Depends upon the agency. DOE and some DOD agencies require an unbelievable level of accounting; obviously some is needed, but the granularity and strict adherence to budgets for what are inherently uncertain tasks (research, after all) is unreasonable.

(20) I found this survey confusing. What is online compliance training? Do you mean RCR? Alternatively, CITI? Do you mean (university name deleted) should have a direct portal for funding reporting? That does not make sense when we use grants.gov and other places.

(21) Honestly not certain.

(23) Not sure. There seem to be many little things that we are required to do, and these all add up and distract us from our real mission of research (as well as teaching).

(24) Post-award grant management support is badly needed to help manage project finances. Staff support for each PI project, at even 0.5-1 hour per week per project would save many hours of PI time.

(25) Dealing with difficult online forms, for example, inputting published papers' references into terrible HTML forms.

(31) The amount of reporting that is redundant. I spend so much time rehashing the same things over and over. Also dealing with emails asking me to do things from an institutional side when the funding agency explicitly tells me not to. I spend more time fighting over non-standard stuff when people could just read an email and realize it's not standard.

(33) Probably no task should be completely eliminated.

(35) It would be wonderful to have a single person help guide PIs through compliance issues from grant submission through implementation, reporting, completion. It's often hard to understand and forecast what is expected and things appear to pop up at the last minute (which could be my fault as I am extremely busy). A timetable or shared calendar of various deadlines/reports would be so helpful and even a visit to the lab group.

(36) Multiple on-line trainings.

(38) We've been steadily removing all compliance tasks we don't feel are necessary over the last 10 years. We've worked with other agencies to reduce what we have to what they need.

(39) We have a large number of internal pre-proposal documents that are institution wide and generally irrelevant to my research. Filling these out takes time and effort and is generally non-useful.

(42) Pretty much all of it. Much of the training is irrelevant to our actual work, and important points are often not covered.

(43) I think the different categories could be unified.

(46) Streamline training videos to reduce redundancy, and remove irrelevant material, such as construction safety for surgeons.

(52) Excessively frequent reporting.

(58) Post award management could be greatly reduced.

(59) Monthly effort reporting.

(60) Initial briefings and kickoff meetings.

What is Redundant? Total records to respond: 26 Total comments: 32

(2) Accounting.

(8) Adding the same information to multiple forms, systems, and internal tracking methods.

(9) Reports to funding agencies.

(13) CV, papers, talk, collaborators submissions, formatting requirements of proposals, font, style and source guidelines, for example use of word versus text being required so that group reference databases cannot be re-used.

(16) The annual reports are very time consuming. We work in collaborations with hundreds of papers per year, they all must be reported in an awful web interface one at a time, and each one requires multiple boxes to click, etc. Most of this information about our publications can be easily looked up online in the appropriate publication databases.

(18) Quarterly narrative reporting of performance measures. While we report on performance measure data quarterly, providing the same narrative (because our process doesn't change and our percentage doesn't fall below the baseline) is tedious.

(21) I have not encountered any.

(23) Submitting "Proposal Submission Request" forms to OCG (contract office).

(24) Filling out the PSR form for (Contract office).This is mostly the same from proposal to proposal, and with the number of proposals submitted this form becomes a burden.

(25) Aspects of reporting. For example, have to put publications in multiple (difficult) places.

(29) Accommodations for students needing more time on tests, or can't take tests at night, etc.

(31) Safety and data management records, which basically don't change but must be done frequently. Also when reporting agencies require bi-weekly or monthly written formal updates.

(33) Export Control Issues.

(36) Bio-Safety and IACUC review at multiple levels Home university AND for same the work, government agency review (i.e., NASA, DoD, etc.).

(39) Proposal preparation: there's a lot of redundant effort between the PI and staff at my institution in forming budgets.

(42) Maintenance of MSDSs for all chemicals.

(43) Anything fiscal or that requires me to click on "business functions."

(45) Compliance refresher quizzes and recertification after passing the initial compliance training sessions/exams.

(46) Training Videos.

(49) How to get rid of hardware when out of date.

(50) Pre-awards, post-awards, reports.

(52) Frequent reports that I know nobody reads.

(57) When post grant reporting is too frequent.

(58) Some of our University reporting is excessive.

(59) Monthly effort reporting.

(60) Report submission to the institution.

What would you change? Total records to respond: 37 Total comments: 46

(2) I would have dedicated people for these tasks since PIs are not the best people to monitor these tasks.

(3) More clear guidelines from the IRB and a faster submission and approval process.

(7) I would like to have easy online proposal systems and not submit by pdf file. Also even though there are online systems to submit report, we have to submit 2 different documents with 2 systems and I would like to have it combine into one system.

(8) Increase communication between central office departments, different research administration software that assists administrators in completing the work. More resources dedicated to understanding award terms and conditions and cost allowability.

(10) Provide more departmental assistance to PIs. There is too much redundancy at the individual PI level. We are all reinventing the wheel each time we report, to a great extent.

(12) IRB could be made easier and the IRB staff could be more helpful. Grant management is almost non-existent at my institution. It makes me nervous and adds a lot of work.

(13) Every time I complete a compliance task I am discussed with a separate administrator - in contracts, or in budgeting, or in property, or in safety, or in educational record keeping. I have no access to staff that can help me in coordinated efforts. Implement online submission of justifications for travel.

(14) More help with budget / accounting tasks.

(18) Again, providing unchanged narrative. Also, I would want to see our state funders (identifiers removed) allow us to set our goal, rather than them setting our goal. We know what we can and cannot achieve, so having an "unknowledgeable" entity set a goal for us is frustrating and demoralizing. If you care what I have to say as a subject-matter expert, then accept the goal that I provide you, since I know my science/subject much better than you do.

(19) Closeout reports that assume that all work is completed months before the end of the project.

(20) (University name) researchers often use unprotected servers and software for calendars, email, and file storage/sharing (i.e. google). For those of us with funding that has security concerns, it would be safest if ALL faculty used the products with a (university name) negotiated secure license. Or (university name) should buy a license for faculty to access google.

(21) I have not dealt with them in a long time, so unfamiliar with many of the tasks.

(23) Minimize them to the extent possible. Or have staff that fill out all the necessary forms to the extent possible, and then actually stop by physically to our offices to consult with us that everything is correct and have us fill out any remaining portions, if needed.

(24) Stop relying on electronic means of requesting more and more information from the PIs. Instead, hire more staff to collect and manage this information, with personal (rather than e-mail) communications. Electronic communications are only serving to levy further bookkeeping burdens on PIs, and effectively discourage them from writing proposals!

(25) I think they're pretty good overall. One suggestion would be to have someone go through grant award management the first time someone receives a substantial award. It took me awhile to learn all of the things I was responsible for, and all of the resources available to me.

(27) Online system developed for the convenience of the developers instead of the users. Ease of accessibility and quick tutorials on how to reduce confusion and time spent.

(29) Have the Compliance Office arrange for testing space/time instead of it being dumped on faculty members for students needing accommodation (approaching 10 to 15% of all students and making it so I am shifting my classes to not have tests - dumbing down the program.

(30) More involvement from lower-level researchers is compliance tasks (esp. solicitation and ongoing reporting). When there is no standardized with, and those tasks are primarily handled by senior researchers, Junior researchers have less insight into the hows and whys of tasks, and are less prepared to eventually serve as a principle investigator. Similarly, senior researchers were less available to actually supervise or direct research.

(31) Have compliance actually listen when something isn't standard.

(32) Tracking a project budget without the finance people is no longer possible. I would love to have a straightforward online system I could access myself.

(33) Probably move towards web based training.

(35) More streamlined and coordinated - a single annual document/checklist or calendar function to better understand overall needs.

(36) I would like more help from OCG. (Contracts office)

(39) It would be very helpful to have a collaborative relationship with the grants office to form budgets. We find we are often not budgeting for things we would assume are provided by the university (supplies, IT support, etc.) and then are asked to pay for them when we request services.

(42) Narrow training to be specific for needs of each lab group.

(43) Two: A. Have a web site that deals with the issues faculty face rather than a truly heinous system designed for business operations. My heart rate goes up 20% every time I need to click on "business systems" or "concur." B. STOP DUMPING EVERYTHING ON FACULTY! The administration should administer and TAKE RESPONSIBILITY for their actions rather than blaming the faculty for everything. Why have a very expensive admin system that can't deal with anything on their own?

(44) Provide an up-to-date listing of all compliance tasks/information that can be made relevant by entering classification information.

(45) Reduce the frequency of on-line compliance refresher quizzes at my university.

(46) Training videos.

(48) Travel authorization.

(49) More aware of what is Perkins (university property) and what is not, to allow for easy updating of hardware.

(50) Providing more support staff to work with individual faculty.

(54) Have a laser safety officer responsible for laser safety compliance.

(55) We have digital accounting but maintain paper-based receipts. This system is well established and has a fail-safe backup but it seems to push around too much paper. The online accounting is difficult to generate financial reports; this should be easier.

(58) Streamline the post award management for the PI.

(59) Twice a year is adequate (effort reporting).

(60) Annual Faculty Activity Report.

Other Comments: Total records to respond: 8 Total comments: 8

(8) Thanks for your work on this!

(19) Grants that require a substantial amount of reporting and/or compliance should also require or at least enable budget for such tasks to be carried out (at least in part) by non-faculty.

(23) It would be helpful to actually have staff or assistants who can help with all the little details. It seems there is no such support, and so all the little details get pushed to the faculty and we have to spend increasingly larger amounts of time on these small tasks rather than research.

(24) Don't think that a solution to compliance burdens lies in setting up a new form or web page to fill out. Electronic reporting is becoming a stifling burden, and a poor excuse for lazy administrators to get the data they need!

(31) If we could get more staff support to streamline the extraneous things like proposal data management reports, etc., I'd have so much extra time to actually do research and write proposals.

(43) Faculty are here to do research and teaching, however a huge part of my day is spent doing trivial administrative tasks. This seems like a waste of University resources.

(50) The low success rate for government grants translates to substantial time inefficiency for researchers. I am not sure how to solve this problem, but it shared among all.

(55) In multi-unit proposals within my university, hierarchies of approval must be obtained from all units before the proposal is submitted. While more time-consuming initially I think this saves time in the long run.

Appendix 2: Text and HTML versions of Questionnaire

Consent Statement: By completing this survey, you are consenting to be in this research study. Your participation is voluntary and you can stop at any time.

Participation statement: Your participation in this research is voluntary. We consider your responses anonymous and any demographic information is to determine the nature of responses we collect.

Introduction: Thank you for agreeing to participate in this study! The purpose of this survey is to determine which compliance functions take the most time in non-medical trial STEM research, in order to develop best practices that will reduce the time investment by faculty in compliance activities. This survey should take less than 10 minutes to complete.

Questions:

Section 1: Please provide the amount of time you or your group spends on compliance functions per week. You may use fractions of hours if necessary. (Note: What takes the most time?)

General Lab Safety
IRB/IACUC (Human/animal subjects)
Special Materials (Biohazards, lasers, radioactive materials, controlled substances)
Record Keeping (research results, safety, compliance requirements, inventory, lab property, etc.).
Pre-award activities (proposal preparation and submission, obtaining matching funds, budgeting, etc.)
Post-award grants management (technical reporting, financial management, records, and reporting)
Results Reporting and Publications
Ethical Concerns (data security, COI, misconduct, audits, export control)
Intellectual Property/Patents

Section 2: Which of these do you have and does it save time? If you do not have it, would having it save time? (Check applicable boxes) (Note: what do you have in place already?)

Item	We have it	We don't have it	Timesaver?
Online compliance training			
Online proposal submission			
Online report submission to your institution			
Online report submission to the funding agency			
Kickoff meetings on each award from contracts and grants			
Initial briefings of requirements from compliance offices			

Section 3: Subjective/Opinion Questions (fillable text boxes) (Note: Opinions on compliance)

1) What part of compliance tasks do you think could be eliminated?
2) What compliance task do you consider most redundant?
3) What would you change about the compliance functions at your institution?

Section 4: Demographics (Note: What type of researcher is answering?)

University Classification (check one: private/public/college/university/technical school)
Research Classification (check one: faculty/post-doc/professional technician)
Number of years as a researcher: (fill in box)
Size of research group: (fill in box)

Section 5: Other comments: (Note: This is a text box to provide further comments to the study)

Conclusion: Thank you for your participation in this survey! We appreciate your time and attention to this matter and we hope that the results gained will assist in the development of best practices for compliance training and reporting. If you wish to provide an email address separately to receive the summary of the results of this data once the study is complete, please send your request to Kathryn.Michel@colorado.edu.

Resize font:

Determining Primary Time Drivers for Compliance

Please complete the survey below.

Thank you!

Introduction

Consent Statement: By completing this survey, you are consenting to be in this research study. Your participation is voluntary and you can stop at any time.

Participation Statement: Your participation in this research is voluntary. We consider your responses anonymous and any demographic information requested is to determine the nature of the responses we collect.

Thank you for agreeing to participate in this study! The purpose of this survey is to determine which compliance functions take the most time in non-medical-trial STEM research, in order to develop best practices that will reduce the time investment by faculty in compliance activities. This survey should take less than 10 minutes to complete.

Section 1: Please provide the amount of time you or your group spends on compliance functions per week. You may use fractions of hours if necessary. If you or your group do not spend time on a particular function, please enter 0.

1) **General Lab Safety**
   * must provide value

2) **IRB/IACUC (Human/Animal Subjects)**
   * must provide value

3) **Special Materials (Bio-Hazards, Lasers, Radioactive Materials, Controlled Substances)**
   * must provide value

4) **Record Keeping (Research Results, Safety, Compliance Requirements, Inventory, Property, etc.)**
   * must provide value

5) **Pre-Award Activities (Proposal Preparation and Submission, Matching Funds, Budgeting, etc.)**
   * must provide value

6) **Post-Award Grants Management (Technical Reporting, Financial Management, Records, Administrative Reporting)**
   * must provide value

7) **Results Reporting and Publications**
   * must provide value

8) **Ethical Concerns (Data Security, Conflict of Interest, Misconduct, Audits, Export Control)**
   * must provide value

9) **Intellectual Property and Patents**
* must provide value

Which of these do you have, and does it save time? If you do not have it, would it save time? (Please check applicable boxes)

	We have it	We do not have it	Does it save us time?
10) **Online compliance training** * must provide value	☐	☐	☐
11) **Online proposal submission** * must provide value	☐	☐	☐
12) **Online report submission to your institution** * must provide value	☐	☐	☐
13) **Online report submission to the funding agency** * must provide value	☐	☐	☐
14) **Kickoff meetings on each award from contracts/grants office** * must provide value	☐	☐	☐
15) **Initial briefings of requirements from compliance offices** * must provide value	☐	☐	☐

Section 3: Subjective/Opinion Questions

16) **What part of compliance tasks do you think could be eliminated?**
Expand

17) **What compliance task do you consider to be the most redundant?**
Expand

18) **What would you change about the compliance tasks at your institution?**
Expand

Section 4: Demographics

19) **Please check your university classification.**
* must provide value

20) **Please check your research classification**
* must provide value

21) **Number of years as a researcher:**
* must provide value

22) **Size of Research Group:**
* must provide value

Section 5: Other Comments

23) **If you have other comments upon the nature of compliance in research or if you have best practices to share that cut down time investment, please share them here:**

Expand

Completion!

Thank you for your participation in this survey! We appreciate your time and attention to this matter and we hope that the results gained will assist in the development of best practices for compliance training and reporting. If you wish to obtain a summary of the results of this data once the study is complete, please send your request to kmichel2@jhu.edu, or Kathryn.Michel@colorado.edu.

Submit

Appendix 3: IRB Approval Letter

Homewood Institutional Review Board
3400 N. Charles Street
Wyman Park Building, Suite N468
Baltimore MD 21218-2685
410-516-6580
http://homewoodirb.jhu.edu/

Michael McCloskey, PhD
IRB Chair

Date: June 19, 2019

PI Name: Jeffrey Kantor
Study #: HIRB00009470
Study Name: Determining primary time drivers for compliance functions in non-medical-trial STEM research, and determining best practices for reducing faculty time investment

Date of Review: 6/18/2019
Date of Acknowledgement: 6/18/2019
Expiration Date: 6/18/2022

The above referenced study has been *acknowledged.*

Review Type:	Exempt
Funding Agency:	Not funded
Grant or Contract Number:	
International Sites:	No
Maximum number of participants:	200
Vulnerable populations:	Johns Hopkins Employees
Consent process:	
Assent Process:	

The Board determined that this research meets the criteria for submission of a Progress Report. The Progress Report must be submitted at least 6 weeks prior to the expiration date shown above on this notice. If the Progress Report is not submitted prior to the expiration date all ongoing research activities must stop immediately, including data analysis. Before any research activity can resume, you

must submit the Progress Report.

No changes may be made to the protocol or the consent form without the approval of the Board.

Please keep in mind that it is your responsibility to inform the HIRB of any adverse consequences to participants that occur in the course of the study, as well as any complaints from participants regarding the research. In conducting this research, you are required to follow the requirements listed in the *HIRB Policies and Procedures Manual.*

Approved Documents:

Recruiting Materials:
Recruitment Email

Study Team Members:
Kathryn Michel

APPROVAL IS GRANTED UNDER THE TERMS OF **FWA00005834** FEDERAL-WIDE ASSURANCE OF COMPLIANCE WITH DHHS REGULATIONS FOR PROTECTION OF HUMAN RESEARCH SUBJECTS

Appendix 4: Recruitment Email

Good Morning!

Here is an opportunity to make your voices heard in how to streamline your research compliance burden!

Despite the streamlining of some government regulation and federal agency policies and the institution of electronic means of submission for various documents, there is still an increase in the amount of time reported by the Federal Demonstration Partnership for compliance activities by faculty to 44.3% as of 2018. The purpose of the survey is to determine which of the compliance functions take the most time or contain the most redundancy; and to hear the opinions of faculty, post-doctoral associates, graduate students, and professional researchers/technicians on if the current facilities available to them are enough. From these answers, I intend to develop a set of best practices that to research administration offices throughout the United States can utilize to better assist with workflow, time management, and resource/direction planning.

This project is a requirement to complete my Masters in Science (Research Administration) Thesis, titled, "Determining primary time drivers for compliance functions in non-medical-trial STEM research, and determining best practices for reducing faculty time investment", with Dr. Jeffrey Kantor at Johns Hopkins University. As the research component of the thesis, I am seeking faculty volunteers who are conducting STEM research that does not include medical trials to answer a short survey. Interested parties should navigate to https://mrprcbcw.hosts.jhmi.edu/redcap/surveys/?s=WA43MYYXCH leading to a 10-minute online survey concerning the amount of time you spend on compliance functions, what facilities and amenities you have available to you, and what your suggestions are to make these processes more efficient. All responses will be de-identified and considered anonymous. For the purposes of this study, please enter your numbers in the following format: 1.0, 0.0, and 0.5.

Due to the nature of this project, please submit responses on or before July 14, 2019.

For more information, please contact me at kmichel2@jhu.edu, or michelk@colorado.edu.

Thank you for your time and consideration,
Kathryn K. Michel
MAST Center Coordinator, University of Colorado
MS Candidate, Johns Hopkins University

Appendix 5: Contact Venue List

Contact Venues Utilized to Distribute Survey:

Email lists utilized, either directly or via networking with respondents

- University of Colorado Engineering and Applied Sciences Weekly Digest
- University of Colorado College of Arts and Sciences Weekly Digest
- Faculty, Post-Doctoral Fellow, and Graduate Student Mailing lists, Membrane Science, Engineering and Technology
- University of Colorado Research Administrators Email list resadmin@lists@colorado.edu
- NSF IU CRC Program Administrators' email list, at iucrc-operations@googlegroups.com
- Utah State University Computer Science Faculty Email List
- University of Arkansas Chemical Engineering Faculty Email List
- Oregon State University College of Engineering Graduate Student Email List
- University of Colorado Health Sciences/Medical School High-Altitude Research Center Mailing List

Social Media outlets posted to:

- Reddit
- Twitter
- Facebook
- Academia.edu
- Quora

Additional notices posted in the CU Boulder College of Engineering main lobby, and outside my office door.

Appendix 6: Raw Data Sheets

Time spent section, RAW DATA

record_id	timestamp	Time Gen lab safety	time_irb	time_spec_mat	time_records	time_preawd	time_postawd	time_pub	time_ethics	time_ip	Notes
1	6/27/2019 11:35	3	0	2	5	100	80	140	4	100	Ineligible response - multiple input errors
2	6/27/2019 12:37	1	0	0	3	5	5	2	1	1	
3	6/27/2019 12:46	4	20	1	20	10	10	20	10	0	
4	6/27/2019 12:47	0.5	0	0.5	1	5	2	4	0.5	4.5	
5	6/27/2019 14:31	0.5	0	5	1	5	7	7	0	0	
6	6/27/2019 16:36	1	0	1	2	0	0	1	0	0	
7	6/27/2019 17:40	0	40	0	40	60	60	10	40	0	Ineligible response for numerical analysis - multiple input errors
8	6/27/2019 17:43	0.5	0	0	1.5	3	5	2	0.5	0.5	
9	6/28/2019 12:40	0.2	0	0.2	2	15	15	10	0	2	
10	6/28/2019 12:43	1	0.1	0.5	1	5	2	10	0.5	0.1	
11	6/28/2019 12:43	0	0	0	2	10	2	10	0	0	
12	6/28/2019 12:59	0	1	0	5	7	2	20	0	0	
13	6/28/2019 13:12	1	0	1	1	4	4	1	1	0	
14	6/28/2019 13:14	1	0	1	3	10	5	2	0	2	
15	6/28/2019 13:15	1	0	0	5	15	2	15	1	0	
16	6/28/2019 22:35	0	0	0.1	0.1	5	2	5	0.1	0	
17	6/30/2019 0:53	0	0	0	0	0.5	0.5	1	0	0	
18	6/30/2019 5:54	1	0	0.5	8	5	5	1	1	0	
19	6/30/2019 23:44	1	0	1	2	10	5	5	1	1	
20	7/1/2019 14:53	0	1	0	5	8	3	10	1	0	

record_id	timestamp	Time Gen lab safety	time_irb	time_spec_mat	time_records	time_preawd	time_pstawd	time_pub	time_ethics	time_ip	Notes
21	7/1/2019 16:03	0	0	0	0	2	1	0	0	0	
22	7/2/2019 11:38	3	2	2	3	3	2	10	1	0	
23	7/2/2019 14:22	0.5	0	0	2	5	5	5	0.3	0.2	
24	7/3/2019 14:56	0.5	0	0.2	3	5	5	5	1	1	
25	7/4/2019 1:24	0	0.2	0	2	3.5	2	3	0.2	0.1	
26	7/5/2019 19:58	0	0.2	0	0.1	2.5	1.5	2	0.1	0	
27	7/8/2019 12:12	0.3	0	5	0.3	3	0	6	0	1	
28	7/8/2019 12:29	0	0	0	0	0	0	0	0	0	
29	7/8/2019 13:23	1	0	0	0.5	30	2	10	0.5	2	
30	7/8/2019 14:02	1	0	2.5	6	16	10	16	0.1	0.5	
31	7/8/2019 14:05	0.2	0	2	2	10	5	5	0	0	
32	7/8/2019 16:18	0	0.1	0.1	1	0.1	1	0.5	0.1	0	
33	7/9/2019 4:36	10	1.1	1.1	2	2	2	2	0.2	1.2	
34	7/9/2019 14:20	2	0	2	8	8	8	4	2	2	
35	7/9/2019 14:45	5	5	0	4	15	10	25	0.5	0	
36	7/9/2019 14:46	2	5	3	5	12	5	18	3	0	
37	7/9/2019 15:10	0	0	0	1	10	1	0	1	0	
38	7/9/2019 15:28	5	0	0	20	2	2	10	5	0	
39	7/9/2019 15:44	0	0	0	5	2	3	5	0.5	0.5	
40	7/9/2019 15:57	0	0	0	5	0	0	10	0	0	
41	7/9/2019 16:36	5	0	3	10	12	6	10	1	0.5	
42	7/9/2019 21:23	0.5	2	0.5	1	5	1	30	0.2	0	
43	7/10/2019 12:33	5	0	5	2	10	5	1	1	0	
44	7/10/2019 12:56	1	0	1	4	4	3	3	1	2	
45	7/10/2019 13:37	10	0	0	25	10	20	30	3	2	
46	7/10/2019 15:37	1	0.2	1	3	1	0	2	0.2	0.2	
47	7/10/2019 16:03	2	0	0	1	5	3	10	0.5	0.5	
48	7/11/2019 11:13	1	0	0	2	3	3	10	0.5	0.5	
49	7/11/2019 11:28	0.1	0	0	0.1	1	0.2	0	1	1	
50	7/11/2019 14:51	1	0	0	1	10	10	10	0.5	2	

record_id	timestamp	Time Gen lab safety	time_irb	time_spec_mat	time_records	time_preawd	time_pstawd	time_pub	time_ethics	time_ip	Notes
51	7/11/2019 17:28	0	0.1	0	5	5	5	5	0.5	0	
52	7/11/2019 20:00	0	0	0	2	15	15	20	0	0	
53	7/12/2019 11:04	0	0	0	0.5	1	1	1	0.5	0.5	
54	7/12/2019 12:10	2	0	1	0.5	8	4	8	1	2	
55	7/12/2019 13:11	0.3	0	0	0.1	15	0	15	0.5	0.3	
56	7/12/2019 15:43	1	0	1	2	10	15	100	2	3	
57	7/12/2019 17:15	1	0	1	1	3	3	3	0.5	1	
58	7/13/2019 9:25	0.5	4	0	1	6	4	7	0.5	0.5	
59	7/13/2019 13:59	0.5	0	0	1	5	5	8	0.5	0.5	
60	7/14/2019 0:34	3	0	2	2	3	3	5	1	1	
61	7/14/2019 6:14	2	0	1	1	0.5	0	10	0	2	

Amenities Section, Binary Questions - RAW DATA

		Online Compliance Training?			Online Proposal Submission?			Online rept submission - Institution?			Online rept submission - agency?			Kickoff Meetings?			Initial Briefings from Compliance Offices?		
record_id	timestamp	ontr___1	ontr___2	ontr___3	onpropsub___1	onpropsub___2	onpropsub___3	onsubinst___1	onsubinst___2	onsubinst___3	onsubag___1	onsubag___2	onsubag___3	kickoff___1	kickoff___2	kickoff___3	compbrief___1	compbrief___2	compbrief___3
1	6/27/2019 11:35	1	0	1	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
2	6/27/2019 12:37	0	1	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0
3	6/27/2019 12:46	1	0	0	1	0	1	0	1	1	0	1	1	0	1	0	1	0	0
4	6/27/2019 12:47	0	1	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0
5	6/27/2019 14:31	0	1	0	1	0	1	0	1	1	0	1	1	0	1	1	0	1	0
6	6/27/2019 16:36	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
7	6/27/2019 17:40	1	0	1	0	1	0	1	0	1	1	0	1	0	1	0	0	1	0
8	6/27/2019 17:43	1	0	1	1	0	0	1	0	1	1	0	1	1	0	1	0	1	0
9	6/28/2019 12:40	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0
10	6/28/2019 12:43	1	0	0	1	0	0	0	1	0	1	0	1	0	1	0	0	1	0
11	6/28/2019 12:43	0	1	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0
12	6/28/2019 12:59	1	0	0	1	0	1	0	1	0	1	0	0	0	1	0	0	1	0
13	6/28/2019 13:12	1	0	0	1	0	0	1	0	0	1	0	0	0	0	1	0	1	0
14	6/28/2019 13:14	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0
15	6/28/2019 13:15	1	0	1	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0
16	6/28/2019 22:35	0	1	0	1	0	0	0	1	0	1	0	0	0	1	0	0	1	0
17	6/30/2019 0:53	0	1	0	1	0	1	1	0	0	1	0	0	0	1	0	0	1	0
18	6/30/2019 5:54	1	0	1	1	0	1	0	1	0	1	0	1	1	0	1	1	0	1
19	6/30/2019 23:44	1	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0	1	0
20	7/1/2019 14:53	1	1	1	1	0	0	0	1	0	1	1	1	0	1	0	0	1	0
21	7/1/2019 16:03	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0
22	7/2/2019 11:38	1	0	0	1	0	0	0	1	0	1	0	1	0	1	1	1	0	0
23	7/2/2019 14:22	1	0	0	1	0	1	1	0	1	1	0	1	0	1	0	0	1	0

		Online			Online Proposal			Online rept			Online rept			Kickoff Meetings?			Initial Briefings		
record_id	timestamp	ontr___1	ontr___2	ontr___3	onpropsub___1	onpropsub___2	onpropsub___3	onsubinst___1	onsubinst___2	onsubinst___3	onsubag___1	onsubag___2	onsubag___3	kickoff___1	kickoff___2	kickoff___3	compbrief___1	compbrief___2	compbrief___3
24	7/3/2019 14:56	0	1	0	1	0	0	0	1	0	1	0	0	0	1	0	1	1	1
25	7/4/2019 1:24	1	0	1	1	0	1	1	0	1	0	0	1	0	1	0	0	1	0
26	7/5/2019 19:58	1	0	1	1	0	0	1	0	1	1	0	1	0	1	1	0	1	1
27	7/8/2019 12:12	1	0	1	1	0	1	1	0	1	1	0	0	1	0	1	1	0	0
28	7/8/2019 12:29	0	1	0	1	0	1	0	1	0	0	1	0	0	1	0	1	0	0
29	7/8/2019 13:23	1	0	0	1	0	1	1	0	1	1	0	1	0	1	0	1	0	0
30	7/8/2019 14:02	0	1	0	1	0	0	0	1	0	1	0	0	0	1	0	0	1	0
31	7/8/2019 14:05	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0
32	7/8/2019 16:18	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0
33	7/9/2019 4:36	1	0	1	1	0	1	1	0	1	1	0	1	0	1	0	0	1	0
34	7/9/2019 14:20	1	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0	1	0
35	7/9/2019 14:45	1	0	0	1	0	0	0	1	0	1	0	0	0	1	0	0	1	0
36	7/9/2019 14:46	1	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	1	0
37	7/9/2019 15:10	1	0	1	0	1	1	0	1	1	0	1	1	1	0	1	1	0	1
38	7/9/2019 15:28	0	1	0	0	1	0	1	0	1	0	1	0	1	0	0	1	0	0
39	7/9/2019 15:44	0	1	0	1	0	1	1	0	0	1	0	1	0	1	1	0	1	1
40	7/9/2019 15:57	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0
41	7/9/2019 16:36	0	1	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0
42	7/9/2019 21:23	1	0	0	1	0	0	1	0	0	1	0	0	0	0	1	0	1	0
43	7/10/2019 12:33	1	0	1	0	1	1	1	0	1	1	0	1	0	1	0	0	1	0
44	7/10/2019 12:56	1	0	1	1	0	1	1	0	1	1	0	1	0	1	0	0	1	0
45	7/10/2019 13:37	1	0	1	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0
46	7/10/2019 15:37	1	0	0	1	0	1	1	0	1	0	1	0	0	1	0	0	1	0
47	7/10/2019 16:03	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0
48	7/11/2019 11:13	1	0	1	1	0	1	1	0	1	1	0	1	0	1	0	0	1	0
49	7/11/2019 11:28	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	0	0
50	7/11/2019 14:51	1	0	0	1	0	1	1	0	1	1	0	1	0	1	0	0	1	0

		Online			Online Proposal			Online rept			Online rept			Kickoff Meetings?			Initial Briefings		
record_id	timestamp	ontr___1	ontr___2	ontr___3	onpropsub___1	onpropsub___2	onpropsub___3	onsubinst___1	onsubinst___2	onsubinst___3	onsubag___1	onsubag___2	onsubag___3	kickoff___1	kickoff___2	kickoff___3	compbrief___1	compbrief___2	compbrief___3
51	7/11/2019 17:28	1	0	0	0	0	1	0	1	0	1	0	0	1	0	1	1	0	0
52	7/11/2019 20:00	0	1	0	1	0	1	1	0	1	1	0	1	1	0	0	0	1	0
53	7/12/2019 11:04	0	1	0	1	0	0	1	0	0	1	0	0	0	0	1	0	1	0
54	7/12/2019 12:10	1	0	1	1	0	1	1	0	1	1	0	0	0	1	0	0	1	0
55	7/12/2019 13:11	1	0	1	1	0	1	0	1	1	1	0	1	0	1	1	0	1	1
56	7/12/2019 15:43	0	1	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	1
57	7/12/2019 17:15	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0
58	7/13/2019 9:25	1	0	1	0	1	0	1	0	0	0	1	0	0	1	0	0	1	0
59	7/13/2019 13:59	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	1	0
60	7/14/2019 0:34	1	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0	0	1
61	7/14/2019 6:14	0	1	0	1	0	0	1	0	0	0	1	0	0	1	0	0	1	0

Subjective Questions Section - RAW DATA

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
1	6/27/2019 11:35				
2	6/27/2019 12:37	financial reporting	accounting	I would have dedicated people for these tasks since PIs are not the best people to monitor these tasks.	
3	6/27/2019 12:46			More clear guidelines from the IRB and a faster submission and approval process.	
4	6/27/2019 12:47				
5	6/27/2019 14:31				
6	6/27/2019 16:36				
7	6/27/2019 17:40	NA	na	I would like to have easy online proposal systems and not submit by pdf file. Also even though there are online systems to submit report, we have to submit 2 different documents with 2 systems and I would like to have it combine into one system.	

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
8	6/27/2019 17:43	Duplicate information requests from multiple campus offices; inconsistency of federal granting organizations and individual grant/contract/cooperative agreement terms and conditions.	Adding the same information to multiple forms, systems, and internal tracking methods.	Increase communication between central office departments, different research administration software that assists administrators in completing the work. More resources dedicated to understanding award terms and conditions and cost allowability.	Thanks for your work on this!
9	6/28/2019 12:40				
10	6/28/2019 12:43		Reports to funding agencies	Provide more departmental assistance to PIs. There is too much redundancy at the individual PI level. We are all reinventing the wheel each time we report, to a great extent.	
11	6/28/2019 12:43				
12	6/28/2019 12:59			IRB could be made easier and the IRB staff could be more helpful. Grant management is almost non-existent at my institution. It makes me nervous and adds a lot of work.	

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
13	6/28/2019 13:12	The form from (identifier removed) that PIs are required to sign for each grant that comes as a separate file when all of the items have already been discussed with an (identifier removed) designate.	cv, papers, talk, collaborators submissions, formatting requirements of proposals, font, style and source guidelines, for example use of word versus tex being required so that group reference databases cannot be re-used	every time I complete a compliance task I am discussed with a separate administrator - in contracts, or in budgeting, or in property, or in safety, or in educational record keeping. I have no access to staff that can help me in coordinated efforts. implement online submission of justifications for travel	
14	6/28/2019 13:14			more help with budget / accounting tasks	
15	6/28/2019 13:15				
16	6/28/2019 22:35	Having to report the number of days each member of the group spent each year in each country. We participate in multiple large collaborations that utilize international facilities, and our funding agency is well aware of this.	The annual reports are very time consuming. We work in collaborations with hundreds of papers per year and they all must be reported in an awful web interface one at at time, and each one requires multiple boxes to click, etc. Most of this information about our publications can be easily looked up online in the appropriate publication databases.		

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
17	6/30/2019 0:53				
18	6/30/2019 5:54	Quarterly narrative reporting of performance measures. While we report on performance measure data quarterly, providing the same narrative (because our process doesn't change) is tedious. Each quarter, I'm told to tweak our narrative so it doesn't sound the same each quarter. If your quarterly data is to provide a certain percentage of family planning methods to a specific age group, and each quarter you exceed the goal, why would you need to provide any additional narrative?	Quarterly narrative reporting of performance measures. While we report on performance measure data quarterly, providing the same narrative (because our process doesn't change and our percentage doesn't fall below the baseline) is tedious.	Again, providing unchanged narrative. Also, I would want to see our state funders ({identifier removed}) allow us to set our goal, rather than them setting our goal. We know what we can and cannot achieve, so having an "unknowledgeable" entity set a goal for us is frustrating and demoralizing. If you care what I have to say as a subject-matter expert, then accept the goal that I provide you, since I know my science/subject much better than you do.	
19	6/30/2019 23:44	depends upon the agency. DOE and some DOD agencies require an unbelievable level of accounting; obviously some is needed, but the granularity and strict adherence to budgets for what are inherently uncertain tasks (research, after all) is unreasonable.		closeout reports that assume that all work is completed months before the end of the project.	Grants that require a substantial amount of reporting and/or compliance should also require or at least enable budget for such tasks to be carried out (at least in part) by non-faculty

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
20	7/1/2019 14:53	I found this survey confusing. 10- what is online compliance training? do you mean RCR?? or CITI?? 13- do you mean (identifier removed)should have a direct portal for funding reporting? that doesn't make sense when we use grants.gov and other places.		(identifier removed) researchers often use unprotected servers and software for calendars, email, and file storage/sharing (i.e. google). For those of us with funding that has security concerns, it would be safest if ALL faculty used the products with a (identifier removed) negotiated secure license. Or (identifier removed)should buy a license for faculty to access google.	
21	7/1/2019 16:03	Honestly not certain.	I have not encountered any.	I have not dealt with them in a long time, so unfamiliar with many of the tasks.	
22	7/2/2019 11:38				

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
23	7/2/2019 14:22	Not sure. There seem to be many little things that we are required to do, and these all add up and distract us from our real mission of research (as well as teaching).	Submitting "Proposal Submission Request" forms to (identifier removed)	Minimize them to the extent possible. Or have staff that fill out all the necessary forms to the extent possible, and then actually stop by physically to our offices to consult with us that everything is correct and have us fill out any remaining portions, if needed.	It would be helpful to actually have staff or assistants who can help with all the little details. It seems there is no such support, and so all the little details get pushed to the faculty and we have to spend increasingly larger amounts of time on these small tasks rather than research.
24	7/3/2019 14:56	Post-award grant management support is badly needed to help manage project finances. Staff support for each PI project at even 0.5-1 hour per week per project would save many hours of PI time.	Filling out the PSR form for (identifier removed). This is mostly the same from proposal to proposal, and with the number of proposals submitted this form becomes a burden.	Stop relying on electronic means of requesting more and more information from the PIs. Instead, hire more staff to collect and manage this information, with personal (rather than e-mail) communications. Electronic communications are only serving to levy further bookeeping burdens on PIs, and effectively discourage them from writing proposals!	Don't think that a solution to compliance burdens lies in setting up a new form or web page to fill out. Electronic reporting is becoming a stifling burden, and a poor excuse for lazy administrators to get the data they need!

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
25	7/4/2019 1:24	Dealing with difficult online forms, for example, inputing published papers' references into terrible HTML forms.	Aspects of reporting. For example have to put publications in multiple (difficult) places.	I think they're pretty good overall. One suggestion would be to have someone go through grant award management the first time someone receives a substantial award. It took me awhile to learn all of the things I was responsible for, and all of the resources available to me.	
26	7/5/2019 19:58				
27	7/8/2019 12:12			Online system developed for the convenience of the developers instead of the users. Ease of accessibility and quick tutorials on how to reduce confusion and time spent.	
28	7/8/2019 12:29				

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
29	7/8/2019 13:23	None	Accommodations for students needing more time on tests, or can't take tests at night, etc.	Have the Compliance Office arrange for testing space/time instead of it being dumped on faculty members for students needing accommodation (approaching 10 to 15% of all students and making it so I am shifting my classes to not have tests - basically dumbing down the program	
30	7/8/2019 14:02			More involvement from lower-level researchers is compliance tasks (esp. solicitation and ongoing reporting). When there is no standardized with, and those tasks are primarily handled by senior researchers, Junior researchers have less insight into the hows and whys of tasks, and are less prepared to eventually serve as a principle investigator. Similarly, senior researchers were less available to actually supervise or direct research.	

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
31	7/8/2019 14:05	The amount of reporting that is redundant. I spend so much time rehashing the same things over and over. Also dealing with emails asking me to do things from an institutional side when the funding agency explicitly tells me not to. I spend more time fighting over non-standard stuff when people could just read an email and realize its not standard.	Safety and data management records which basically don't change but must be done frequently. Also when reporting agencies require bi-weekly or monthly written formal updates.	Have compliance actually listen when something isn't standard.	If we could get more staff support to streamline the extraneous things like proposal data management reports, etc., I'd have so much extra time to actually do research and write proposals.
32	7/8/2019 16:18			Tracking a project budget without the finance people is no longer possible. I would love to have a straightforward online system I could access myself.	
33	7/9/2019 4:36	Probably no task should be completely eliminated	export control issues	Probably move towards web based training.	
34	7/9/2019 14:20				

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
35	7/9/2019 14:45	It would be wonderful to have a single person help guide PIs through compliance issues from grant submission through implementation, reporting, completion. Its often hard to understand and forecast what is expected and things appear to pop up at the last minute (which could be my fault as I am extremely busy). A timetable or shared calendar of various deadlines/reports would be so helpful and even a visit to the lab group.		more streamlined and coordinated - a single annual document/checklist or calendar function to better understand overall needs	
36	7/9/2019 14:46	Multiple on-line trainings.	BioSafety and IACUC review at multiple levels Home university AND for same the work, government agency review (i.e., NASA, DoD, etc.)	I would like more help from OCG.	
37	7/9/2019 15:10	None.	No response.	No response.	

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
38	7/9/2019 15:28	We've been steadily removing all compliance tasks we don't feel are necessary over the last 10 years. We've worked with other agencies to reduce what we have to what they need.			
39	7/9/2019 15:44	We have a large number of internal pre-proposal documents that are institution wide and generally irrelevant to my research. Filling these out takes time and effort and is generally non-useful.	Proposal preparation: there's a lot of redundant effort between the PI and staff at my institution in forming budgets.	It would be very helpful to have a collaborative relationship with the grants office to form budgets. We find we are often not budgeting for things we would assume are provided by the university (supplies, IT support, etc.) and then are asked to pay for them when we request services.	
40	7/9/2019 15:57				
41	7/9/2019 16:36				
42	7/9/2019 21:23	pretty much all of it. Much of the training is irrelevant to our actual work, and important points are often not covered.	Maintenance of MSDS's for all chemicals.	Narrow training to be specific for needs of each lab group.	

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
43	7/10/2019 12:33	I think the different categories could be unified.	Anything fiscal or that requires me to click on "business functions."	Two: A. Have a web site that deals with the issues faculty face rather then a truly heinous system designed for business operations. My heart rate goes up 20% everytime I need to click on "business systems" or "concur." B. STOP DUMPING EVERYTHING ON FACULTY !! The administration should administer and TAKE RESPONSIBILITY for their actions rather than blaming the faculty for everything. Why have a very expensive admin system that can't deal with anything on their own?	Faculty are here to do research and teaching, however a huge part of my day is spent doing trivial administrative tasks. This seems like a waste of University resources.
44	7/10/2019 12:56			Provide an up-to-date listing of all compliance tasks/information that can be made relevant by entering classification information	

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
45	7/10/2019 13:37		Compliance refresher quizzes and recertification after passing the initial compliance training sessions/exams.	Reduce the frequency of on-line compliance refresher quizzes at my university.	
46	7/10/2019 15:37	Streamline training videos to reduce redundancy, and remove irrelevant material, such as construction safety for surgeons.	Training videos	Training videos	
47	7/10/2019 16:03				
48	7/11/2019 11:13	N/A	N/A	Travel authorization	N/A
49	7/11/2019 11:28		How to get rid of hardware when out of date.	More awar of what is Perkins and what is not, to allow for easy updating of hardware.	
50	7/11/2019 14:51	none	Preawards, postawards, reports	providing more support staff to work with individual faculty	The low success rate for government grants translates to substantial time inefficiency for researchers. I am not sure how to solve this problem, but it shared among all.
51	7/11/2019 17:28				
52	7/11/2019 20:00	Excessively frequent reporting.	Frequent reports that I know nobody reads.	Nothing.	
53	7/12/2019 11:04				
54	7/12/2019 12:10			Have a laser safety officer responsible for laser safety compliance	

		What can be eliminated?	What is redundant?	What would you change?	Other comments
record_id	timestamp	op_elim	op_red	op_change	other_comm
55	7/12/2019 13:11			We have digital accounting but maintain paper-based receipts. This system is well established and has a fail-safe backup but it seems to push around too much paper. The online accounting is difficult to generate financial reports; this should be easier.	In multi-unit proposals within my university, hierarchies of approval must be obtained from all units before the proposal is submitted. While more time-consuming initially I think this saves time in the long run.
56	7/12/2019 15:43				
57	7/12/2019 17:15	None	When post grant reporting is too frequent	No idea!	
58	7/13/2019 9:25	Post award management could be greatly reduced.	Some of our University reporting is excessive.	Streamline the post award management for the PI.	
59	7/13/2019 13:59	monthly effort reporting	monthly effort reporting	twice a year is adequate	
60	7/14/2019 0:34	Initial briefings and kickoff meetings	report submission to the institution.	Annual faculty activity report	
61	7/14/2019 6:14				

Demographics - RAW DATA

		University type	Research Role	Years as a researcher	Size of research group	Notes
record_id	timestamp	univtype	restype	timeres	ressize	
1	6/27/2019 11:35	2	1	40	8	**Ineligible response - multiple input errors**
2	6/27/2019 12:37	2	1	38	6	
3	6/27/2019 12:46	2	2	6	4	
4	6/27/2019 12:47	2	1	25	4	
5	6/27/2019 14:31	2	3	<1.0	8	
6	6/27/2019 16:36	2	3	3	10	
7	6/27/2019 17:40	2	1	3	2	Ineligible response for numerical analysis - multiple input errors
8	6/27/2019 17:43	2	4	6	40	
9	6/28/2019 12:40	2	1	23	8	
10	6/28/2019 12:43	2	1	37	2	
11	6/28/2019 12:43	2	1	45	25	
12	6/28/2019 12:59	4	1	17	5	
13	6/28/2019 13:12	2	1	20	8	
14	6/28/2019 13:14	2	1	20	4	
15	6/28/2019 13:15	2	1	25	8	
16	6/28/2019 22:35	2	1	20	6	
17	6/30/2019 0:53	2	1	14	15	
18	6/30/2019 5:54	2	4	12	20000	Ineligible data point - who has a research group of 20,000 people? This is likely an input error.
19	6/30/2019 23:44	2	1	13	10	

		University type	Research Role	Years as a researcher	Size of research group	Notes
record_id	timestamp	univtype	restype	timeres	ressize	
20	7/1/2019 14:53	2	1	12	4	
21	7/1/2019 16:03	2	1	5	3	
22	7/2/2019 11:38	1	3	7	9	
23	7/2/2019 14:22	2	1	27	7	
24	7/3/2019 14:56	2	1	38	25	
25	7/4/2019 1:24	2	1	10	14	
26	7/5/2019 19:58	2	1	11	10	
27	7/8/2019 12:12	2	3	4	9	
28	7/8/2019 12:29	2	3	1	16	
29	7/8/2019 13:23	2	1	40	10	
30	7/8/2019 14:02	4	4	3	8	
31	7/8/2019 14:05	2	1	7	7	
32	7/8/2019 16:18	2	1	30	4	
33	7/9/2019 4:36	2	1	20	12	
34	7/9/2019 14:20	2	1	25	9	
35	7/9/2019 14:45	2	1	25	10	
36	7/9/2019 14:46	2	1	30 yrs	10	
37	7/9/2019 15:10	2	4	6	500	Ineligible data point - 500-person research group is unlikely at best, and this is likely an input error.
38	7/9/2019 15:28	6	4	30	7	
39	7/9/2019 15:44	2	1	16	10	
40	7/9/2019 15:57	2	3	1	4	
41	7/9/2019 16:36	2	3	8	12	
42	7/9/2019 21:23	2	1	45	5	
43	7/10/2019 12:33	2	1	30	7	

		University type	Research Role	Years as a researcher	Size of research group	Notes
record_id	timestamp	univtype	restype	timeres	ressize	
44	7/10/2019 12:56	2	1	42	12	
45	7/10/2019 13:37	2	1	25	8	
46	7/10/2019 15:37	2	3	6	4	
47	7/10/2019 16:03	2	1	45	10	
48	7/11/2019 11:13	2	1	20	6	
49	7/11/2019 11:28	5	1	N/a. Teacher	10-20 students	
50	7/11/2019 14:51	2	1	25	12	
51	7/11/2019 17:28	2	1	7	3	
52	7/11/2019 20:00	2	1	17	10 students	
53	7/12/2019 11:04	2	3	4	3	
54	7/12/2019 12:10	2	1	20	5	
55	7/12/2019 13:11	2	1	20	13	
56	7/12/2019 15:43	2	1	16	16	
57	7/12/2019 17:15	2	3	5	8	
58	7/13/2019 9:25	2	1	11	11	
59	7/13/2019 13:59	4	1	25	20	
60	7/14/2019 0:34	2	1	30	6	
61	7/14/2019 6:14	2	3	4	10	

Acknowledgements

My family: Mom, what more could I say? You made this possible. Richard, you kept the house running when I could not; you fed me, encouraged me, and made me sleep. I could not ask for a better partner, or husband. Dad, you reminded me that science is everywhere we look, including in administration; and your respect and encouragement are valued beyond measure. Percy the cat was my study partner and reminded me to take breaks by putting a paw on my keyboard. She passed July 5, 2019, at nearly 21 years old.

Charles Murray-Todd: Thank you for stepping up and taking on the duties that I could not; and for reminding me that not only do I have to do homework but I also have to breathe. I cannot thank you enough.

Professors Jeffrey Kantor and Marianne Woods: Thank you for taking a chance on a 50-year old woman in this program. The gift of your faith and encouragement is priceless.

Professors Alan Greenberg, Yifu Ding, Victor Bright, Rich Noble, and all four sites of the NSF I/U CRC MAST Center: Thank you for providing valuable information regarding the PI's role in compliance, for answering annoying questions and for encouraging me to use the knowledge that I had to make our processes better.

Dr. Daniel Dvorkin: Thank you for allowing me to consult with you regarding the data generated by this project.

Professor Dan Watson – you reminded me that administrators can and must be scientists too. You provided me with the reasons behind the structure, and advised, "This too was normal". Thank you for mentoring me, and for being my friend.

For all the people who assisted and supported me by forwarding the survey that was the basis of this thesis, who proofread my papers, who encouraged me, who asked me if my

homework was done, who provided information, encouragement, and quotes, who shoved food in my face, who made me see the sun, and talked “shop” with me. Thank you!

Dedication:

This thesis is dedicated to everyone who thought they were too old to undertake graduate school after 40 but did it anyway. Balancing the demands of an advanced education path with maintenance of full-time employment, family, and some semblance of sanity is a Herculean feat, and I have completed this academic goal with your inspiration in mind.

Biographical Statement/Curriculum Vitae (Based on NSF Biosketch Format)

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PROFESSIONAL PREPARATION

Associate of Arts	Psychology/Anthropology	Front Range Community College	2001
Bachelor of Arts	Psychology	University of Colorado Boulder	2004
Master of Science	Research Administration	Johns Hopkins University	2019

Employment Skill Summary:

- 18 years of experience working in Academia at the University of Colorado and 17 years of budgetary development and project management, including Research Center management, financial management, and procurement for three Engineering Research Centers; 16 years of experience in the Private Sector in Accounting, Administrative, Mortgage, and Loan Servicing industries.
- Extensive knowledge of general fund and grant fund accounting, strong knowledge of auxiliary, gift and plant fund account parameters; daily and intensive use of PeopleSoft FIN and HR production modules, CU Marketplace, Concur, InfoEd, and COGNOS. Expert in financial process of project management, quick study in financial regulations, and a proven record of finding novel solutions while working within project budget parameters. Experience in training others in procurement and financial regulations and procurement, reimbursement, and reporting systems.
- Proven interpersonal communication skills both written and verbal, working with diverse groups; extensive experience in writing handbooks and process instructions for financial applications accessible by a wide variety of people
- Keen sense of creativity and detail focus, which allows high level of project standards. Skilled with computer and internet and an ability to learn new computer tools at high speed. Experience with building and editing HTML/web pages via Dreamweaver and Wix.
- Management of 30 students for a Senior Design student procurement program and management of a 4-site Research Experience for Undergraduates program (15 students, 4 years).
- Extensive experience running national and international scientific/industry conference events, both at CU Boulder and at remote venues. Able to assess strengths and weaknesses of a situation or process to find efficiency improvements, including on-site troubleshooting.
- State of Colorado Certified Program Assistant II, Account Technician III, and Administrative Assistant II.
- 34 years volunteer work with a non-profit educational organization devoted to historical research, including service in regional officer and peer-counseling positions.
- Author of publications for both professional and academic/volunteer interests covering a range of subjects including Accounting, Event Management, and Psychology.
- Invited Speaker/Panel Moderator at the National Science Foundation Industry/University Cooperative Research Center Annual Meeting, January 2013, 2014, 2015, and July 2017.

CURRENT APPOINTMENTS:

The University of Colorado (Boulder, CO)
Administrative Research Associate, JILA, Kapteyn-Murnane Group (25% appointment). This position manages travel arrangements, event logistics, and reimbursements for the KM Group and the STROBE Center, as well as providing administrative support and a point of contact for the KM Group visitors. Duties are varied, but fall within the range of the Program Assistant II job description listed below with the MAST Center.

The University of Colorado (Boulder, CO)
August 2009-Present: Center Coordinator, Membrane Science, Engineering and Technology Center (MAST). The position of Center Coordinator reports to the Center Director and is solely responsible for professional management of the Membrane Applied Science and Technology Center in matters concerning administration and finance. This entry is a promotion from the Financial Coordinator position with MAST (2001-2009), is a State of Colorado Classified Staff position as a Program Assistant II.

PAST APPOINTMENTS AT THE UNIVERSITY OF COLORADO:
- July 2007- August 2009 and August 2014-2017: Financial Coordinator, Colorado Center for Biorefining and Bioproducts (C2B2).
- January 2001- August 2009: Financial Coordinator, Membrane Science, Engineering and Technology Center (MAST).
- July 2005- July 2007: Financial Coordinator, Senior Design Program, Department of Mechanical Engineering.
- January 2000- January 2001: Assistant Pre-Award Coordinator, Office of Contracts and Grants.

SELECTED PUBLICATIONS/PRESENTATIONS
Peer-Reviewed Publications:
- Michel, Kathryn; Liaison and Logistics Work with Industrial Advisory Boards", Journal of Research Administration, Volume XLV No. 2, Pages 61-72. (2014)

Presentations:
- Michel, Kathryn; "Introductory Concepts of Business Communication, Regulatory Compliance, and Budget Issues", Invited Presentation, C2B2 2017 REU Lecture Series, July 2017.
- Michel, Kathryn, Bazakos, Mike, and Caudill, Linda; "Streamlining your I/U CRC"; Invited presentation and Session Moderator, NSF 2015 I/U CRC Annual Meeting, Arlington, VA.
- Kathryn Michel, Andrea Palmeri, Lisa Schabenberger, and Darlene Brown, "Fantastic Meetings", Invited Presentation and Operations Fair Booth, NSF 2014 Annual I/U CRC meeting, Arlington, VA.
- Kathryn Michel and Alan Greenberg; "Effective Practices for IAB Meeting Logistics", Invited presentation, NSF I/U CRC 2013 Annual Meeting, Arlington, VA.

SYNERGISTIC ACTIVITIES
- REU Program Coordinator 2014-2017; Colorado Center for Biorefining and Biofuels (C2B2)
- Media Liaison, Pennsic War, 2014-2017, SCA, Inc. (educational non-profit organization).

- Mental Health First Aid Certification, good through 5/13/21

BIOGRAPHICAL INFORMATION
Born June 11, 1968, Riverside, California
Married, no children.

REFERENCES:
- Professor Alan R. Greenberg, Department of Mechanical Engineering, University of Colorado Boulder.
- Professor Douglas Gin, Department of Chemical and Biological Engineering, University of Colorado Boulder.